Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Mikrobiologija in genetika prokariontov
Course title:	Microbiology and Prokaryotic Genetics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program: Biologija, 1. stopnja		**3.**	**5.**
Undergraduate university programme: Biology, 1st level		**3rd**	**5th**

Vrsta predmeta / Course type	Obvezni/Compulsory
Univerzitetna koda predmeta / University course code:	**B149**

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. Vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
45			**45**		**90**	**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:

- Zgodovinski pregled razvoja mikrobiologije;
- Morfološka in funkcijska diverziteta mikrobov;
- Osnove virologije;
- Celična biologija mikroorganizmov;
- Bakterije in rast;
- Osnove mikrobne ekologije;
- Osnove izražanja genov v prokariontski genetiki;
- Osnove mikrobne virulence in patogeneze;
- Osnove imunologije;
- Antibiotiki;
- Mutacije in mutageneza;
- Horizontalni genski prenosi.

Vaje:

- Osnovne tehnike izolacije, gojenja ter identifikacije okoljsko pomembnih mikroorganizmov iz različnih okolij;
- Testiranje učinkovitosti protimikrobnih sredstev ter interpretacija rezultatov;
- Laboratorijske tehnike genskih prenosov pri prokariontih (izolacija plazmidne DNA, transformacija, konjugacija, transdukcija).

Content (Syllabus outline):

Lectures:

- Historical overview of the microbiology development;
- Morphological and functional diversity of microbes;
- Fundamentals of virology;
- Cell biology of microorganisms;
- Bacteria and growth;
- Fundamentals of microbial ecology;
- Fundamentals of gene expression in prokaryotic genetics;
- Fundamentals of microbial virulence and pathogenesis;
- Fundamentals of immunology;
- Antibiotics;
- Mutations and mutagenesis;
- Horizontal gene transfer.

Tutorial:

- Basic techniques of isolation, cultivation and identification of ecologically important microorganisms;
- Antimicrobial susceptibility testing and its interpretation;
- Laboratory techniques of gene transfer in prokaryotes (isolation of plasmid DNA, transformation, conjugation, transduction).

Temeljni literatura in viri / Readings:

- Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., Stahl, D. A. (2022). *Brock biology of microorganisms* (16. izdaja, str. 1124). Pearson.
- Slonczewski, J., Foster, J. W., Zinser, E. R. (2024). *Microbiology: an evolving science* (6. izdaja, str. 1 zv. (loč. pag.)). W. W. Norton & Company.
- Snyder, L., Peters, J. E., Henkin, T. M., Champness, W. (2013). *Molecular genetics of bacteria* (4. izdaja). ASM Press. Dostopno na: Molecular Genetics Of Bacteria 4th Edition : Free Download, Borrow, and Streaming : Internet Archive

Cilji in kompetence:	**Objectives and competences:**
• Predstaviti osnovne skupine mikroorganizmov, njihovo biologijo ter sistematiko; • Razumeti vlogo mikroorganizmov pri naravnih procesih ter možnosti za njihovo uporabo v industriji in drugje; • Podati osnove in posebnosti prokariontske genetike.	• To present the biology and systematics of main groups of microorganisms; • To understand the role of microorganisms in natural processes and their potential use in industry and elsewhere; • To present the basics of prokaryotic genetics.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Študent našteje skupine mikroorganizmov in jih uvrsti v filogenetsko drevo življenja; • Študent pojasni vlogo posameznih skupin mikroorganizmov v naravnih procesih; • Študent pojasni zgradbo, replikacijo in izražanje prokariontskega genoma; • Študent razume vlogo mutacij in horizontalnih genskih prenosov za spreminjanje genoma prokariontov.	Knowledge and understanding: • The student lists the groups of microorganisms and places them in the phylogenetic tree of life; • The student explains the role of individual groups of microorganisms in natural processes; • The student explains the structure, replication and expression of the prokaryotic genome; • The student understands the role of mutations and horizontal gene transfer to alter the genome of prokaryotes.

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. VAJDIČ, Tadeja, **STARČIČ ERJAVEC, Marjanca**. Harnessing environmental yeasts - *Pichia kudriavzevii* strain ZMUM_K002 : the quest for isolates with properties for efficient biotechnological applications. *Applied microbiology*. 2025, vol. 5, no. 1, [article no.] 30, 15 str..
2. MIHAILOVSKAYA, Veronika S., **STARČIČ ERJAVEC, Marjanca**, KUZNETSOVA, Marina V. *Escherichia coli* from healthy farm animals : antimicrobial resistance, resistance genes and mobile genetic elements. *Acta veterinaria Hungarica*. 2024, vol. 72, iss. 4, str. 225-234.
3. 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**. Genomic characterization of extended-spectrum β-lactamase-producing and third-generation cephalosporin-resistant *Escherichia coli* isolated from stools of primary healthcare patients in Ethiopia. *Antibiotics*. 2024, vol. 13, issue 9, [article no.] 851, str. 1-19
4. ORLOVA, Ekaterina G., MASLENNIKOVA, Irina L., POSPELOVA, Julia S., **STARČIČ ERJAVEC, Marjanca**, LOGINOVA, Natalia P., TROINICH, Yana N., KUZNETSOVA, Marina V. The effect of *Escherichia coli* ŽP strain with a conjugation-based colicin E7 delivery on growth performance, hematological, biochemical, and histological parameters, gut microbiota, and nonspecific immunity of broilers. *Canadian journal of microbiology*. Nov. 2022, vol. 68, no. 11, str. 687-702.
5. **STARČIČ ERJAVEC, Marjanca**, JESENIČNIK, Karmen, ELAM, Lauren P., KASTRIN, Andrej, PREDOJEVIĆ, Luka, SYSOEVA, Tatyana. Complete sequence of classic F-type plasmid pRK100 shows unique conservation over time and geographic location. *Plasmid*. 2022, vol. 119/120, str. 1-8.