



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Biokemija z osnovami mikrobiologije in genetike
Course title:	Biochemistry with Fundamentals of Microbiology and Genetics

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Predmetni učitelj / 1. in 2. stopnja Subject teacher / 1. and 2. level		2. 2 nd	4. 4 th

Vrsta predmeta / Course type

Obvezni/ Compulsory

Univerzitetna koda predmeta / University course code:

UB05

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
60			30		210	10

Nosilec predmeta / Lecturer:

Marjanca STARČIČ ERJAVEC

Jeziki /

Predavanja / Lectures:

Slovenski / Slovene

Languages:

Vaje / Tutorial:

Slovenski / Slovene

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

Jih ni.

Prerequisites:

No.

Vsebina:

Predavanja:

Biokemija:

- Aminokisline, peptidi, proteini: struktura, funkcija, metabolizem;
- Ogljikovi hidrati: struktura, funkcija, metabolizem;
- Lipidi: struktura, funkcija, metabolizem;

Content (Syllabus outline):

Lectures:

Biochemistry:

- Amino acids, peptides, proteins: structure, function, metabolism;
- Carbohydrates: structure, function, metabolism;
- Lipids: structure, function, metabolism;



- Nukleinske kisline: struktura, funkcija in metabolizem;
- Dihalna veriga in oksidativna fosforilacija, fotosinteza;
- Hormoni: struktura, funkcija in metabolizem.

Osnove mikrobiologije in genetike:

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

Vaje:

- Osnovne metode določanja vsebnosti proteinov, lipidov in ogljikovih hidratov v bioloških vzorcih;
- Osnovne biokemijske laboratorijske metode: homogenizacija, frakcionirano obarjanje, gelska kromatografija, osnovna encimska kinetika;
- Izolacija nukleinskih kislin;
- Osnovne tehnike izolacije, gojenja ter identifikacije okoljsko pomembnih mikroorganizmov iz različnih okolij;

- Nucleic acids: structure, function, metabolism;
- Respiratory chain and oxidative; phosphorylation, photosynthesis;
- Hormones: structure, function, metabolism.

Fundamentals of microbiology and genetics:

- 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 microbial genetics;
- Fundamentals of microbial virulence and pathogenesis;
- Fundamentals of immunology;
- Antibiotics;
- Mutations and mutagenesis;
- Horizontal gene transfer.

Tutorial:

- Basic methods for the determination of protein, lipid and carbohydrate content in biological samples;
- Basic biochemical laboratory methods: homogenization, fractionary precipitation, gel chromatography, basic enzymatic kinetics;
- Isolation of nucleic acids;
- Basic techniques of isolation, cultivation and identification of ecologically important microorganisms;



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- Testiranje učinkovitosti protimikrobnih sredstev ter interpretacija rezultatov.

- Antimicrobial susceptibility testing and its interpretation.

Temeljni literatura in viri / Readings:

- Ahern, K., Rajagopal, I., Tan, T. (2018). *Biochemistry free for all*. Oregon State University. Dostopno na: [Biochemistry: Free For All - Open Textbook Library](#)
- Nelson, D. L., Cox, M. M. (2005). *Lehninger principles of biochemistry* (4. izdaja, str. XXV, 1119, 91). W. H. Freeman.
- Boyer, R. F. (2005). *Temelji biokemije* (str. XXVI, 634). Študentska založba.
- 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](#)
- Mavrek, N., Krampač, L., Spasovski, N. (2024). *Mikrobna genetika: temeljni koncepti genetike prokariontov* (M. Starčič Erjavec & J. Ambrožič, Ur.; 1. e-izd.). Založba Univerze. <https://ebooks.uni-lj.si/ZalozbaUL/catalog/book/563>

Cilji in kompetence:

- Seznanitev študentov s kemijsko zgradbo in reakcijami v bioloških sistemih;
- Seznanitev študentov z zgradbo, delovanjem in praktičnim delom z mikroorganizmi;
- Seznanitev študentov z zgradbo, prenosom, ekspresijo in manipulacijo dednega materiala.

Objectives and competences:

- Inform students about chemical structure and reactions in biological systems;
- Inform students about structure, function and practical work with microorganisms;
- Inform students about structure, transfer, expression and manipulation of genetic material.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Študent pozna kemijsko sestavo živih organizmov in zna pojasniti funkcije, razgradnjo in sintezo posameznih skupin makromolekul;

Intended learning outcomes:

Knowledge and understanding:

- The student knows chemical constituents of living organisms and can explain the function, degradation and synthesis of different groups of macromolecules;



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• Študent pozna zgradbo in delovanje osnovnih skupin mikroorganizmov in zna pojasniti pomen mikroorganizmov za okolje in človeka; • Študent pozna zgradbo in funkcije prokariotskega dednega materiala in zna pojasniti možnosti njegovega spreminjanja.	• The student knows the structure and function of the main groups of microorganisms and can explain the importance of microorganisms for environment and humans; • The student knows the structure and function of hereditary prokaryotic material and can explain the possibilities of its transformation.
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Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Laboratory practicals

Načini ocenjevanja:

- Kolokvij
- Pisni izpit

Delež (v %) /

Weight (in %)

Assessment:

	50	• Midterm exam
	50	• 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. MOLAN, Katja, AMBROŽIČ, Jerneja, LIKAR, Matevž, PONGRAC BARLOVIČ, Draženka, ŽGURBERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. Fecal short-chain fatty acids are associated with obesity in gestational diabetes. *Biomedicines*. [Online ed.]. 2025, vol. 13, iss. 2, [article no.] 387, str. 1-13.
3. KUZNETSOVA, Marina V., MIHAILOVSKAYA, Veronika S., SELIVANOVA, Polina A., KOCHERGINA, Darja A., REMEZOVSKAYA, Natalia B., **STARČIČ ERJAVEC, Marjanca**. Siderophore production, diversity of siderophore receptors and associations with virulence-associated genes, phylogroups and bacteriocin production in *Escherichia coli* strains isolated from humans, animals and organic fertilizers. *Microbiology research*. 2025, vol. 16, iss. 2, [article no.] 50, 14 str.
4. KUZNETSOVA, Marina V., NESTEROVA, Larisa Jur'evna, MIHAILOVSKAYA, Veronika S., SELIVANOVA, Polina A., KOCHERGINA, Darja A., KARIPOVA, Marina O., VALTSIFER, Igor V., AVERKINA, Anastasia S., **STARČIČ ERJAVEC, Marjanca**. Nosocomial *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*: sensitivity to chlorhexidine-based biocides and prevalence of efflux pump genes. *International journal of molecular sciences*. 2025, vol. 26, issue 1, [article no.] 355, str. 1-23



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5. PREDOJEVIĆ, Luka, KEŠE, Darja, ŽGUR-BERTOK, Darja, KORVA, Miša, ERDANI-KREFT, Mateja, **STARČIČ ERJAVEC, Marjanca**. Cytokine response of the biomimetic porcine urothelial model to different *Escherichia coli* strains. *Applied sciences*. 2022, iss. 17, art. 8567, str. 1-11.