



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	4

Vrsta predmeta / Course type:

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
60	-	-	30	-	210	10

Nosilec predmeta / Lecturer:

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

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

Vsebina:
Biokemija:
Proteini: aminokislina, peptidi, proteini, encimi, koencimi, metabolizem proteinov in aminokislin.
Ogljikovi hidrati: struktura, klasifikacija, funkcija in metabolizem.
Lipidi: struktura, klasifikacija, funkcija in metabolizem.
Nukleinske kisline: struktura, funkcija in metabolizem.

Content (Syllabus outline):
Biochemistry:
Proteins: amino acids, peptides, proteins, enzymes, coenzymes, metabolism of proteins and amino acids.
Carbohydrates: structure, classification, function and metabolism.
Lipids: structure, classification, function and metabolism.
Nucleic acids: structure, function and metabolism.



Dihalna veriga in oksidativna fosforilacija, fotosinteza.

Osnove mikrobiologije:

Definicija, taksonomija in pomen mikroorganizmov. Bakterije: morfologija, zgradba bakterijske celice, metabolizem, razmnoževanje, genetika, patogenost. Virusi: oblike in zgradba, razmnoževanje. Viroidi, prioni.

Osnove genetike:

Struktura in replikacija DNA, struktura prokariotskih in evkariotskih kromosomov. Mutacije DNA in mehanizmi njihovega popravljanja. Izražanje DNA: transkripcija, translacija, regulacija. Prenos DNA: intracelularni (rekombinacija in transpozicija), intercelularni (transformacija, transdukcija, konjugacija).

Respiratory chain and oxidative phosphorylation, photosynthesis.

Fundamentals of microbiology:

Definition, taxonomy and importance of microorganisms. Bacteria: morphology, structure of bacterial cell, metabolism, reproduction, genetics, pathogenicity. Viruses: forms and structure, multiplication. Viroids and prions.

Fundamentals of genetics:

DNA structure and replication, structure of prokaryotic and eukaryotic chromosomes. DNA mutations and mechanisms of their repair. DNA expression: transcription, translation, regulation. Transfer of DNA: intracellular (recombination, transposition), intercellular (transformation, transduction, conjugation).

Temeljni literatura in viri / Readings:

Priporočena literatura:

- Madigan MT, Martinko JM, Bender KS, Buckley DH, Stahl DA. 2015. Brock Biology of Microorganisms. 14. izdaja, Pearson, 1130 str.
- Slonczewski J in Foster JW. 2017. Microbiology: An Evolving Science. 4. izdaja, Norton WW & Company, 1376 str.
- Nelson DL in Cox MM 2012. Lehninger Principles of Biochemistry. 7. izdaja. 1328 str., Freeman WH.
- Voet D, Voet JG in Pratt JG. 2018. Voet's Principles of Biochemistry. 1200 str., John Wiley & Sons.

Cilji in kompetence:

- Seznanitev študentov s kemijsko zgradbo in reakcijami v bioloških sistemih.
- Seznanitev študentov z zgradbo, delovanjem in praktičnim delom z mikroorganizmi.

Objectives and competences:

- Inform students with chemical structure and reactions in biological systems.
- Inform students with structure, function and practical work with microorganisms.



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- Seznanitev študentov z zgradbo, prenosom, ekspresijo in manipulacijo dednega materiala.

- Inform students with structure, transfer, expression and manipulation of genetic material.

Predvideni študijski rezultati:

Po uspešno opravljeni učni enoti naj bi bili študenti zmožni:

- razumeti sestavo živih organizmov ter funkcije, razgradnjo in sintezo posameznih skupin makromolekul.
- pojasniti zgradbo in delovanje osnovnih skupin mikroorganizmov in razumeti pomen mikroorganizmov za okolje in človeka.
- opisati zgradbo in funkcije dednega materiala z možnostmi njegovega spreminjanja.

Intended learning outcomes:

By the end of this course students should be able to:

- understand chemical constituents of living organisms, their function and interconversions.
- explain structure and function of the main groups of microorganisms and understand the importance of microorganisms for environment and humans.
- describe structure and function of hereditary material with possibilities of its transformation.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Individualno delo

Learning and teaching methods:

- Lectures
- Laboratory exercises
- Individual work

Načini ocenjevanja:

Delež (v %) /

Weight (in %) /

Assessment:

	Delež (v %) / Weight (in %) /	Assessment:
Kolokvij	50%	Exam of laboratory exercises
Pisni izpit	50%	Written exam

Reference nosilca / Lecturer's references:

1. Jelenko K., Cepec E., Nascimento F.X., **Trček J.** 2023. Comparative genomics and phenotypic characterization of *Gluconacetobacter entanii*, a highly acetic acid-tolerant bacterium from vinegars. *Foods* 12(1), 1-15.
2. Simonič M., Slapničar Š., **Trček J.**, Bogovič Matijašič B., Mohar Lorbeg P., Vesel A., Fras Zemljič L., Peršin Fratnik Z. 2023. Probiotic *Lactobacillus paragasseri* K7 nanofiber encapsulation using nozzle-free electrospinning. *Appl. Biochem. Biotechnol.* v tisku, 12 str.
3. Cepec E. in **Trček J.** 2022. Antimicrobial resistance of *Acetobacter* and *Komagataeibacter* species originating from vinegars. *Int. J. Environ. Res. Public Health* 19(1), str. 1-10.



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4. Ajdnik U., Fras Zemljič L., Plohl, O., Pérez L., **Trček J.**, Bračič M., Mohan T. 2021. Bioactive functional nanolayers of chitosan-lysine surfactant with single- and mixed-protein-repellent and antibiofilm properties for medical implants. *ACS Appl. Mater. Interfaces* 13(20), 23352–23368.
5. **Trček J.**, Dogša I., Accetto T., Stopar D. 2021. Acetan and acetan-like polysaccharides: genetics, biosynthesis, structure, and viscoelasticity. *Polymers* 13(5), 1-16.