



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

Obvezni/ Obligatory

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:

Janja TRČEK

Jeziki / Predavanja / Lectures: slovenski / slovene

Languages: Vaje / Tutorial: slovenski / slovene

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

Izpit iz kemije.

Prerequisites:

Passed exam in chemistry.

Vsebina:

Biokemija:
Proteini: aminokislina, peptidi, proteini, encimi, koencimi, imobilizirani encimi, metabolizem proteinov in aminokislin.
Ogljikovi hidrati: struktura, klasifikacija, funkcija, razgradnja, biosinteza.
Lipidi: struktura, klasifikacija, funkcija, razgradnja, biosinteza.
Nukleinske kisline: struktura, biosinteza in funkcija, razgradnja. Dihalna veriga in

Content (Syllabus outline):

Biochemistry:
Proteins: amino acids, peptides, proteins, enzymes, coenzymes, immobilized enzymes, metabolism of proteins and amino acids.
Carbohydrates: structure, classification, function, catabolism, biosynthesis. Lipids: structure, classification, function, digestion, biosynthesis. Nucleic acids: structure, biosynthesis and function, degradation.
Respiratory chain and oxidative



oksidativna fosforilacija, fotosinteza.
Hormonski mehanizmi.

Osnove mikrobiologije:

Definicija, taksonomija, filogeneza in pomen mikroorganizmov. Bakterije: taksonomija, morfologija, zgradba bakterijske celice, metabolizem, razmnoževanje, genetika, patogenost. Virusi: oblike in zgradba, razmnoževanje, inhibicija. Viroidi, prioni. Antimikrobne snovi. Osnove imunologije.

Osnove genetike:

Molekularna genetika: struktura DNA, sekveniranje DNA, genomika, struktura prokariotskih in eukariotskih kromosomov. Podvojevanje DNA pri prokariotih in eukariotih, verižna reakcija s polimerazo (PCR). Mutacije in njihovo popravilo, mutageneza in karcinogeneza. Funkcije DNA: transkripcija, translacija, regulacija. Prenos DNA: intracelularni (rekombinacija in transpozicija), intercelularni (transformacija, transdukcija, konjugacija). Aplikacije molekularne genetike: genetski inženiring, uporabni rezultati.

phosphorylation, photosynthesis. Hormone mechanisms.

Fundamentals of microbiology:

Definition, taxonomy, phylogenesis and importance of microorganisms. Bacteria: taxonomy, morphology, structure of bacterial cell, metabolism, reproduction, genetics, pathogenicity. Viruses: forms and structure, multiplication, inhibition. Viroids and prions. Antimicrobial agents. Essentials of immunology. Practical: sterilization, culture media and aseptic technique, qualitative and quantitative methods, preserving pure cultures.

Fundamentals of genetics

DNA structure, DNA sequencing, genomics, structure of prokaryotic and eukaryotic chromosomes. DNA replication in prokaryotes and eukaryotes, polymerase chain reaction (PCR). Mutations and their repair, mutagenesis and carcinogenesis. DNA function: transcription, translation, regulation. Transfer of DNA: intracellular (recombination, transposition), intercellular (transformation, transduction, conjugation). Application of molecular genetics: genetic engineering, useful results.

Temeljni literatura in viri / Readings:

J. Berg, J.L. Tymoczko, L. Stryer. 2011. Biochemistry, International Edition. 7. izdaja. 1098 str., Palgrave Macmillan.
Madigan MT, Martinko JM, Dunlap PV, Clark DP. 2009. Brock Biology of Microorganisms, 12. izdaja, Benjamin Cummings.

Cilji in kompetence:

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

Objectives and competences:

- Inform the students with chemical structure and reactions in biological systems.
- Inform the students with structure, function and manipulation of microorganisms.



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

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

Predvideni študijski rezultati:

Znanje in razumevanje:

Poznavanje kemijskih sestavin živih organizmov in razumevanje njihove funkcije ter medsebojnih pretvorb.

Poznavanje zgradbe in delovanja osnovnih skupin mikroorganizmov in razumevanje pomena mikroorganizmov z živi svet in človeka.

Poznavanje zgradbe in razumevanje funkcije dednega materiala z možnostmi njegovega spreminjanja.

Prenesljive/ključne spretnosti in drugi atributi:

Obvladovanje osnovnih biokemijskih, mikrobioloških in genetskih laboratorijskih tehnik.

Intended learning outcomes:

Knowledge and understanding:

Knowledge on chemical constituents of living organisms and understanding their function and their interconversions.

Knowledge on structure and function of the main groups of microorganisms and understanding the importance of microorganisms for life on the world and for a man.

Knowledge on structure and understanding the function of hereditary material with possibilities

Transferable/Key Skills and other attributes:

Key skills in biochemistry, microbiology and genetic laboratory techniques.

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:

Kolokvij	40%	Exam of laboratory exercises
Izpit	60%	Examination



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Reference nosilca / Lecturer's references:

1. Škraban J., Kyrpides N.C., Shapiro N., Whitmann W.B., **Trček J.** 2018. Draft genome sequence of *Chryseobacterium limigenitum* SUR2^T (LMG 28734^T) isolated from dehydrated sludge. *Braz. J. Microbiol.* 49 (1), 5-6.
2. Simon L., Škraban J., Kyrpides N.C., Woyke T., Shapiro N., Cleenwerck I., Vandamme P., Whitman W.B., **Trček J.** 2017. *Paenibacillus aquistagni* sp. nov., isolated from an artificial lake accumulating industrial wastewater. *Antonie van Leeuwenhoek* 110 (9), 1189-1197.
3. **Trček J.**, Mahnič A., Rupnik M. 2016. Diversity of the microbiota involved in wine and organic apple cider submerged vinegar production as revealed by DHPLC analysis and next-generation sequencing. *Int. J. Food Microbiol.* 223, 57-62.
4. Štornik A., Skok B., **Trček J.** 2016. Comparison of cultivable acetic acid bacterial microbiota in organic and conventional apple cider vinegar. *Food Technol. Biotechnol.* 54 (1), 133-119.
5. **Trček J.** in Matsushita K. 2013. A unique enzyme of acetic acid bacteria, PQQ-dependent alcohol dehydrogenase is also present in *Frateuria aurantia*. *Appl. Microbiol. Biotechnol.* 97, 7369-7376.