



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
Enovit magistrski študijski program druge stopnje Predmetni učitelj	/	2	3
Five-year master's degree program Subject Teacher	/		

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:	<input type="text" value="slovenski / slovene"/>
Languages:	Vaje / Tutorial:	<input type="text" value="slovenski / slovene"/>

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

Prerequisites:

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 oksidativna fosforilacija, fotosinteza.
Hormonski mehanizmi.

Osnove mikrobiologije:
Definicija, taksonomija, filogeneza in pomen mikroorganizmov. Bakterije: taksonomija,

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 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:

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.

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.

D.J. Voet and J.G. Voet. 2011. Biochemistry. 4. izdaja, 1520 str., John Wiley & Sons.

Cilji in kompetence:

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

Objectives and competences:

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

Predvideni študijski rezultati:

Intended learning outcomes:

<p>Znanje in razumevanje: Poznavanje kemijskih sestavin živih organizmov in razumevanje njihove funkcije ter medsebojnih pretvorb.</p> <p>Poznavanje zgradbe in delovanja osnovnih skupin mikroorganizmov in razumevanje pomena mikroorganizmov z živi svet in človeka.</p> <p>Poznavanje zgradbe in razumevanje funkcije dednega materiala z možnostmi njegovega spreminjanja.</p> <p>Prenesljive/ključne spretnosti in drugi atributi: Ovladovanje osnovnih biokemijskih, mikrobioloških in genetskih laboratorijskih tehnik.</p>	<p>Knowledge and understanding: Knowledge on chemical constituents of living organisms and understanding their function and their interconversions.</p> <p>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.</p> <p>Knowledge on structure and understanding the function of hereditary material with possibilities</p> <p>Transferable/Key Skills and other attributes: Key skills in biochemistry, microbiology and genetic laboratory techniques.</p>
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<p>Metode poučevanja in učenja:</p> <ul style="list-style-type: none"> • Predavanja • Laboratorijske vaje • Individualno delo 	<p>Learning and teaching methods:</p> <ul style="list-style-type: none"> • Lectures • Laboratory exercises • Individual work
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Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Kolokvij	40%	Exam of laboratory exercises
Izpit	60%	Examination

Reference nosilca / Lecturer's references:

<ol style="list-style-type: none"> 1. Trček, J., Fuchs, T.M., and K. Trülsch. 2010. Analysis of <i>Yersinia enterocolitica</i> invasion expression <i>in vitro</i> and <i>in vivo</i> using a novel <i>luxCDABE</i> reporter system. Microbiology, 156, 2734-2745. 2. Trček, J., Toyama, H., Czuba, J., Misiewicz, A., and K. Matsushita. 2006. Correlation between acetic acid resistance and characteristics of PQQ-dependent ADH in acetic acid bacteria. Appl. Microbiol. Biotechnol. 70, 366-373. 3. Trček, J. 2005. Quick identification of acetic acid bacteria based on nucleotide sequences of the 16S-23S rDNA internal transcribed spacer region and of the PQQ-dependent alcohol dehydrogenase gene. Syst. Appl. Microbiol. 28, 735-745. 4. Trček, J., Wilharm, G., Jacobi, C.A., and J. Heesemann. 2002. <i>Yersinia enterocolitica</i> YopQ: strain dependent cytosolic accumulation and post-translational secretion. Microbiology, 148, 1457-1465.
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