



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

**Predmet:** Mikrobiologija in genetika prokariotov  
**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:**

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
45	-	30	-	-	105	6

**Nosilec predmeta / Lecturer:**

Janja TRČEK

**Jeziki /  
Languages:**

**Predavanja /  
Lectures:** Slovenski  
Slovene  
**Vaje / Tutorial:** Slovenski/Slovene

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

Jih ni.

**Prerequisites:**

No.

**Vsebina:**

V okviru predmeta bodo študentje spoznali tri osnovne skupine, ki so predmet obravnave v mikrobiologiji (virusi, bakterije, glive – deloma), značilnosti njihove zgradbe, osnove sistematike ter njihov ekološki pomen v različnih okoljih.

Obnovili bodo osnove metabolnih reakcij (redoks reakcije, fermentacija, aerobna in anaerobna respiracija) ter spoznali metabolno raznolikost prokariotov - heterotrofni, avtotrofni in litotrofni metabolizem.

Poudarek bo na nekaterih metabolnih posebnostih prokariotov (fiksacija dušika, redukcija sulfata, metanogeneza, razgradnja polimerov) in njihov pomen v primarni produkciji ter pri kroženju snovi v okolju.

Nadalje bodo obravnavali povezave prokariotov z višjimi organizmi, ki so lahko pozitivne (pomen normalnih mikrobov pri človeku, živalih in rastlinah, pomen mikrobnih simbiotov) ali negativne (nalezljive bolezni ter vpliv ekoloških sprememb na njihov razvoj in širjenje).

Spoznali bodo posebnosti zgradbe bakterijskega in virusnega genoma, mehanizme horizontalnih prenosov dednine in posebnosti pri načinu uravnavanja izražanja genov.

Pri praktičnem delu bodo študentje spoznali osnovne tehnike izolacije, gojenja ter identifikacije okoljsko pomembnih mikroorganizmov iz različnih okolij.

**Content (Syllabus outline):**

Students will get familiar with the three large groups which are objectives of microbiology (viruses, bacteria, fungi – partially), their structure, basic systematic and ecological importance within different ecosystems. Basic metabolic reactions (redox reactions, fermentation, aerobic and anaerobic respiration) and the metabolic diversity of prokaryotes will be addressed (heterotrophic, autotrophic and litotrophic metabolism). Some specific types of metabolisms (nitrate fixation, sulfate reduction, methanogenesis and polymer degradation) which all have substantial role in primary production and in cycling of elements will be studied into more detail.

Students will learn about mechanisms and the importance of interactions of microbes with higher organisms: the role of normal microbes in humans, animals and plants (positive effects) and effect of ecological changes on emergence and dispersion of infectious diseases (negative effects).

Students will learn the structure of bacterial and viral genome, the mechanisms of horizontal transfer of genetic information and examples of gene regulation in prokaryotes. In practical work, students will learn the basic techniques of isolation, cultivation and identification of ecologically important microorganisms.

**Temeljni literatura in viri / Readings:**

- Madigan MT, Bender KS, Buckley DH, Sattley WM, Stahl DA. 2020. Brock Biology of Microorganisms, 16. izdaja, Pearson.
- Slonczewski J., Foster JW. 2020. Microbiology: An Evolving Science. 5. izdaja. Norton WW & Company.
- Snyder L in Peters JE 2020. Molecular Genetics of Bacteria. 5. izdaja, ASM Press.

**Cilji in kompetence:**

- Predstaviti osnovne skupine mikroorganizmov, njihovo biologijo ter sistematiko.
- Predstaviti vlogo mikroorganizmov pri naravnih procesih ter možnosti za njihovo uporabo v industriji in drugje.
- Podati osnove in posebnosti prokariontske genetike.

**Objectives and competences:**

- Familiarity with the biology and systematic of main groups of microorganisms.
- To explain the role of microorganisms in natural processes and their potential use in industry and elsewhere.
- Understanding of prokaryote genetics.

**Predvideni študijski rezultati:****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.

**Prenesljive/ključne spretnosti in drugi atributi:**

- Seznanjanje z osnovnimi pojmi v mikrobiologiji in prokariontski genetiki.
- Seznanjanje z osnovnimi mikrobiološkimi tehnikami.

**Intended learning outcomes:****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.

**Transferable/Key Skills and other attributes:**

- Understanding of basic terms in microbiology and prokaryote genetics.
- Development of practical laboratory skills and basic microbiological techniques.

**Metode poučevanja in učenja:**

- Predavanja
- Laboratorijske vaje
- Individualno delo s študenti

**Learning and teaching methods:**

- Lectures
- Laboratory excersises
- Individual work with students

**Načini ocenjevanja:**

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

- Kolokvij
- Pisni izpit

Delež (v %) /

Weight (in %) /

**Assessment:**

Type (examination, oral, coursework, project):

- Partial exam
- Written

#### 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 Matijašić 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. and **Trček J.** 2022. Antimicrobial resistance of *Acetobacter* and *Komagataeibacter* species originating from vinegars. *Int. J. Environ. Res. Public Health* 19(1), str. 1-10.
4. Cetecioglu Z., Atasoy M., Cenian A., Sołowski G., **Trček J.**, Ugurlu A., Sedlakova-Kadukova J. 2022. Bio-based processes for material and energy production from waste streams under acidic conditions. *Fermentation* 8(3), str. 1-18.
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.