



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	<b>Mikrobiologija in genetika prokariotov</b>
<b>Course title:</b>	<b>Microbiology and Prokaryotic Genetics</b>

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

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:

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

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

**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, Martinko JM, Bender KS, Buckley DH, Stahl DA 2015. Brock Biology of Microorganisms, 14. izdaja, Pearson, 1130 str.
- Tortora GJ, Funke BR, Case CL 2018. Microbiology: A Introduction, 13. izdaja, Pearson, 960 str.
- Snyder L in Peters JE 2013. Molecular Genetics of Bacteria. 4. izdaja, ASM Press, 728 str.

**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:**

- okoljsko pomembnih skupin mikroorganizmov
- njihove vloge pri naravnih procesih
- zgradbe in delovanja 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:**

- of ecologically important groups of microorganisms
- of their role in natural processes
- of structure and function of prokaryote 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

<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
Način (pisni izpit, ustno izpraševanje, naloge, projekt):		Type (examination, oral, coursework, project):
• Kolokvij	50 %	• Partial exam
• Pisni izpit	50 %	• Written

#### Reference nosilca / Lecturer's references:

1. Škraban J., Cleenwerck I., Vandamme P., Fanedl L., **Trček J.** 2018. Genome sequences and description of novel exopolysaccharides producing species *Komagataeibacter pomaceti* sp. nov. and reclassification of *Komagataeibacter kombuchae* (Dutta and Gachhui 2007) Yamada et al., 2013 as a later heterotypic synonym of *Komagataeibacter hansenii* (Gosselé et al. 1983) Yamada et al., 2013. Syst. Appl. Microbiol. 41 (6), 581-592.
2. Lee C., Franke K.B., Kamal S.M., Kim H., Lünsdorf H., Jäger J., Nimtz M., **Trček J.**, Jänsch L., Bukau B., Mogk A., Römling U. 2018. Stand-alone ClpG disaggregase confers superior heat tolerance to bacteria. Proc. Natl. Acad. Sci. USA 115 (2):E273-E282.
3. Škraban J., Kyrpides N.C., Shapiro N., Whitmann W.B., **Trček J.** 2018. Draft genome sequence of *Chryseobacterium limigenitum* SUR2<sup>T</sup> (LMG 28734<sup>T</sup>) isolated from dehydrated sludge. Braz. J. Microbiol. 49 (1), 5-6.
4. 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.
5. **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.