



Univerza v Mariboru

Fakulteta za naravoslovje  
in matematiko

**UČNI NAČRT PREDMETA / COURSE SYLLABUS**

<b>Predmet:</b>	<b>Geomikrobiologija</b>
<b>Course title:</b>	<b>Geomicrobiology</b>

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program: Biologija, 1. stopnja		2. ali 3.	3. ali 4. ali 5. ali 6.
Undergraduate university programme: Biology, 1st level		2nd or 3rd	3rd or 4th or 5th or 6th

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
30		15			135	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:**

Obravnavana bodo naslednja poglavja:

- Zemlja kot habitat za mikroorganizme: litosfera, hidrosfera in atmosfera
- Fiziološko pomembne skupine prokariontov, ki so vključene v geomikrobiološke procese
- Vloga mikroorganizmov pri konverziji anorganskih snovi v litosferi in hidrosferi
- Mikrobna mineralizacija organskih snovi
- Produkti mikrobnega metabolizma, ki lahko povzročijo geomikrobiološke transformacije
- Fizikalni dejavniki, ki vplivajo na geomikrobno aktivnost
- Tvorba in razgradnja karbonatov, ki jo vodijo mikroorganizmi
- Geomikrobne interakcije s fosforjem
- Pomembne geomikrobne interakcije z dušikom
- Geomikrobno kroženje železa
- Geomikrobno kroženje mangana
- Geomikrobno kroženje žvepla
- Geomikrobiologija fosilnih goriv

**Content (Syllabus outline):**

Topics in the following issues will be discussed:

- Earth as a microbial habitat: lithosphere, hydrosphere and atmosphere
- Geomicrobially important physiological groups of prokaryotes
- Role of microbes in inorganic conversion in lithosphere and hydrosphere
- Microbial mineralization of organic matter
- Microbial products of metabolism that can cause geomicrobial transformations
- Physical parameters that influence geomicrobial activity
- Microbial formation and degradation of carbonates
- Geomicrobial interactions with phosphorus
- Geomicrobially important interactions with nitrogen
- Geomicrobiology of iron
- Geomicrobiology of manganese
- Geomicrobiology of sulfur
- Geomicrobiology of fossil fuels

**Temeljni literatura in viri / Readings:**

- Madigan M.T., Martinko J.M., Bender K.S., Buckley D.H., Stahl D.A. 2015. Brock Biology of Microorganisms, 14. izdaja, Pearson, 1130 str.
- Ehrlich H.L. in Newman D.K. 2009. Geomicrobiology, 5. izdaja, CRC Press, 606 str.
- Kirchman D.L. 2012. Processes in Microbial Ecology, 1. izdaja, Oxford University Press, 328 str.

**Cilji in kompetence:**

- Podrobno razložiti vlogo mikroorganizmov pri številnih geoloških procesih na Zemlji: kroženju organskih in nekaterih anorganskih snovi na in pod površino Zemlje, razgradnji kamnin, tvorbi in transformaciji zemlje in sedimentov in nastanku in razgradnji različnih mineralov in fosilnih goriv
- Podrobno razložiti biokemijske procese, ki jih vodijo mikroorganizmi v interakciji z neživimi deli narave in opisati njihove posledice na vizualne spremembe v okolju.
- Opisati skupine mikroorganizmov, ki so vključeni v geomikrobno kroženje ogljika, fosforja, dušika, železa, mangana in žvepla.
- Podrobno razložiti vlogo mikroorganizmov pri nastanku fosilnih goriv

**Objectives and competences:**

- To give an advanced review of roles that microbes play on Earth in geologic processes: cycling of organic and some forms of inorganic matter at the surface and in the subsurface of Earth, the weathering of rocks, soil and sediment formation and transformation, and the genesis and degradation of various minerals and fossil fuels
- Explain in detail biochemical processes that the microbes perform in interactions with nonliving parts of nature and describe the visual effects of these processes on the environment
- Describe the groups of microorganisms involved in geomicrobial cycling of carbon, phosphorus, nitrogen, iron, manganese and sulfur

- Explain in detail the role of microbes in fossil fuels formation

**Predvideni študijski rezultati:**

**Znanje in razumevanje:**

- Študenti dobijo izčrpen pregled nad interakcijami mikroorganizmov z neživimi deli Zemlje, kot je prst, sedimenti, minerali, kamni in atmosfera
- Rezultate geomikrobnih procesov znajo razložiti s pomočjo biokemijskih reakcij in jih tudi identificirati z natančnim opazovanjem v okolju

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

Praktično znanje metod, ki jih uporabljamo pri študiju razumevanja interakcij mikroorganizmov z neživimi deli Zemlje

**Intended learning outcomes:**

**Knowledge and understanding:**

- Students get a comprehensive overview of the interactions between microbes and non-living parts of Earth, such as soil, sediments, minerals, rocks and atmosphere
- Students are able to explain the results of geomicrobial processes by biochemical reactions and also to identify them in nature by precise observations of the environment

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

Practical knowledge of methods applicable for studying interactions of microorganisms with non-living parts of Earth

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

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

1. 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.
2. 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.
3. Korenak J., Ploder J., **Trček J.**, Hélix-Nielsen C., Petrinic I. 2018. Decolourisation and biodegradation of model azo dye solutions using a sequence batch reactor, followed by ultrafiltration. *Int. J. Environ. Sci. Technol.* 15 (3), 483-492.
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, Janja.** 2014. Oksalotrofne bakterije s tvorbo kalcita prispevajo k zniževanju koncentracije ogljikovega dioksida v ozračju. *Proteus*, april, 76, 8, str. 372-374.