



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>

<b>Študijski program in stopnja</b> Study programme and level	<b>Študijska smer</b> Study field	<b>Letnik</b> Academic year	<b>Semester</b> Semester
<b>Univerzitetni študijski program</b> <b>Ekologija z naravovarstvom, 1. stopnja</b>		<b>2. ali 3.</b>	<b>3. ali 4. ali 5. ali 6.</b>
<b>Undergraduate university programme</b> <b>Ecology with Nature Conservation, 1st degree</b>		<b>2nd or 3rd</b>	<b>3rd or 4th or 5th or 6th</b>

**Vrsta predmeta / Course type**

**Univerzitetna koda predmeta / University course code:**

<b>Predavanja</b> Lectures	<b>Seminar</b> Seminar	<b>Vaje</b> Tutorial	<b>Klinične vaje</b> work	<b>Druge oblike študija</b>	<b>Samost. delo</b> Individ. work	<b>ECTS</b>
<b>30</b>	<b>-</b>	<b>15</b>	<b>-</b>	<b>-</b>	<b>135</b>	<b>6</b>

**Nosilec predmeta / Lecturer:**

<b>Jeziki /</b> <b>Languages:</b>	<b>Predavanja /</b>	<input type="text" value="Slovenski"/>
	<b>Lectures:</b>	<input type="text" value="Slovene"/>
	<b>Vaje / Tutorial:</b>	<input type="text" value="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. 2014. Brock Biology of Microorganisms, 14. izdaja, Benjamin Cummings, 1136 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. **TRČEK, Janja.** 2014. Oksalotrofne bakterije s tvorbo kalcita prispevajo k zniževanju koncentracije ogljikovega dioksida v ozračju. *Proteus*, april, 76, 8, str. 372-374.
2. **TRČEK, Janja, SIMON, Lučka.** 2014. Microbial diversity in a deposition lake of industrial wastewater: has the iron selected for specific microbiota in the artificial lake?. V: 15th International Symposium on Microbial Ecology, 24-29 August 2014, Seoul. Abstract book: proceedings: ISME 15. 2014, str. 688.
3. **TRČEK, Janja, MATSUSHITA, Kazunobu.** 2013. A unique enzyme of acetic acid bacteria, PQQ-dependent alcohol dehydrogenase, is also present in *Frateuria aurantia*. *Applied microbiology*

and biotechnology, 97, 16, str. 7369-7376.

4. CASTRO, Cristina, CLEENWERCK, Ilse, **TRČEK, Janja**, ZULUAGA, Robin, DE VOS, Paul, CARO, Gloria, AGUIRRE, Ricardo, PUTAUX, Jean-Luc, GAÑÁN, Piedad. 2013. *Gluconacetobacter medellinensis* sp. nov., cellulose- and non-cellulose producing acetic acid bacteria isolated from vinegar. International journal of systematic and evolutionary microbiology, 63, 3, str. 1119-1125.

5. **TRČEK, Janja**, FUCHS, Thilo M., TRÜLZSCH, Konrad. 2010. Analysis of *Yersinia enterocolitica* invasin expression in vitro and in vivo using a novel luxCDABE reporter system. Microbiology, 156, 9, str. 2734-2745.