



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Geomikrobiologija
Course title:	Geomicrobiology

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 MT, Bender KS, Buckley DH, Sattley WM, Stahl DA. 2020. Brock Biology of Microorganisms, 16. izdaja, Pearson.
- Ehrlich HL, Newman DK, Kappler A. 2021. Ehrlich's Geomicrobiology, 6. izdaja, CRC Press.
- Kirchman DL. 2012. Processes in Microbial Ecology, 2. izdaja, Oxford University Press.

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

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Način (pisni izpit, ustno izpraševanje, naloge, projekt): <ul style="list-style-type: none"> • Kolokvij • Pisni izpit 	50 % 50 %	Type (examination, oral, coursework, project): <ul style="list-style-type: none"> • Partial exam • Written exam

Reference nosilca / Lecturer's references:

1. 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.
2. 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.
3. **Trček J.**, Dogša I., Accetto T., Stopar D. 2021. Acetan and acetan-like polysaccharides: genetics, biosynthesis, structure, and viscoelasticity. *Polymers* 13(5), 1-16.
4. Lee C., Klockgether J., Fischer S., **Trček J.**, Tümmler B., Römling U. Why? - Successful *Pseudomonas aeruginosa* clones with a focus on clone C. *FEMS microbiology reviews*. 2020, 44(6), 740-762.