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: Ekologija, 1. stopnja		**2. ali 3.**	**3. ali 4. ali 5. ali 6.**
Undergraduate university programme: Ecology with Nature Conservation, 1st level		**2nd or 3rd**	**3rd or 4th or 5th or 6th**

Vrsta predmeta / Course type Izbirni/Elective

Univerzitetna koda predmeta / University course code: **B300**

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			**15**		**135**	**6**

Nosilec predmeta / Lecturer: Marjanca STARČIČ ERJAVEC

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisites:**
Jih ni.	No.

Vsebina:

Predavanja:

- Zemlja kot habitat za mikroorganizme: litosfera, hidrosfera in atmosfera;
- Geomikrobiološko pomembne skupine prokariontov;
- Vloga mikroorganizmov pri anorganski konverziji v litosferi in hidrosferi;
- Mikrobna mineralizacija organskih snovi;
- Produkti mikrobnega metabolizma, ki povzročijo geomikrobiološke transformacije;
- Fizikalni dejavniki, ki vplivajo na geomikrobno aktivnost;
- Mikrobna tvorba in razgradnja karbonatov;
- Geomikrobne interakcije s kemijskimi elementi;
- Geomikrobiologija fosilnih goriv.

Vaje:

- Laboratorijske simulacije biogeokemijskega kroženja elementov (žveplo, železo, dušik);
- Mikrobna biomineralizacija

Content (Syllabus outline):

Lectures:

- 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 cause geomicrobial transformations;
- Physical parameters that influence geomicrobial activity;
- Microbial formation and degradation of carbonates;
- Geomicrobial interactions chemical elements;
- Geomicrobiology of fossil fuels.

Tutorial:

- Laboratory simulations of biogeochemical cycling of elements (sulphur, iron, nitrogen),
- Microbial biomineralization

Temeljni literatura in viri / Readings:

- Madigan, M. T., Bender, K. S., Buckley, D. H., Sattley, W. M., Stahl, D. A. (2022). *Brock biology of microorganisms* (16. izdaja, str. 1124). Pearson.

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

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

in sedimentov in nastanku in razgradnji različnih mineralov in fosilnih goriv; • Podrobno razložiti biokemijske procese, ki jih vodijo mikroorganizmi v interakciji z neživo naravo in opisati njihove posledice na vizualne spremembe v okolju; • Opisati skupine mikroorganizmov, ki so vključeni v gemikrobno kroženje ogljika, fosforja, dušika, železa, mangana in žvepla; • Podrobno razložiti vlogo mikroorganizmov pri nastanku fosilnih goriv.	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 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 sulphur; • Explain in detail the role of microbes in fossil fuels formation.

Predvideni študijski rezultati:	**Intended learning outcomes:**
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.	**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.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Laboratorijske vaje	• Lectures • Laboratory practicals

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Kolokvij • Pisni izpit	**50** **50**	• Partial exam • Written exam

Reference nosilca / Lecturer's references:

1. VAJDIČ, Tadeja, **STARČIČ ERJAVEC, Marjanca**. Harnessing environmental yeasts - *Pichia kudriavzevii* strain ZMUM_K002 : the quest for isolates with properties for efficient biotechnological applications. *Applied microbiology*. 2025, vol. 5, no. 1, [article no.] 30, 15 str.
2. MIHAILOVSKAYA, Veronika S., **STARČIČ ERJAVEC, Marjanca**, KUZNETSOVA, Marina V. *Escherichia coli* from healthy farm animals : antimicrobial resistance, resistance genes and mobile genetic elements. *Acta veterinaria Hungarica*. 2024, vol. 72, iss. 4, str. 225-234.
3. DENEKE, Wolde, EGUALE, Tadesse, MEDHIN, Girmay, HAILE, Aklilu Feleke, ALEMAYEHU, Haile, MIHRET, Adane, PIRŠ, Mateja, STRAŠEK SMRDEL, Katja, AVBERŠEK, Jana, KUŠAR, Darja, CERAR KIŠEK, Tjaša, JANKO, Tea, STEYER, Andrej, **STARČIČ ERJAVEC, Marjanca**. Genomic characterization of extended-spectrum β-lactamase-producing and third-generation cephalosporin-resistant *Escherichia coli* isolated from stools of primary healthcare patients in Ethiopia. *Antibiotics*. 2024, vol. 13, issue 9, [article no.] 851, str. 1-19
4. ORLOVA, Ekaterina G., MASLENNIKOVA, Irina L., POSPELOVA, Julia S., **STARČIČ ERJAVEC, Marjanca**, LOGINOVA, Natalia P., TROINICH, Yana N., KUZNETSOVA, Marina V. The effect of *Escherichia coli* ŽP strain with a conjugation-based colicin E7 delivery on growth performance, hematological, biochemical, and histological parameters, gut microbiota, and nonspecific immunity of broilers. *Canadian journal of microbiology*. Nov. 2022, vol. 68, no. 11, str. 687-702.
5. **STARČIČ ERJAVEC, Marjanca**, JESENIČNIK, Karmen, ELAM, Lauren P., KASTRIN, Andrej, PREDOJEVIĆ, Luka, SYSOEVA, Tatyana. Complete sequence of classic F-type plasmid pRK100 shows unique conservation over time and geographic location. *Plasmid*. 2022, vol. 119/120, str. 1-8.