



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Mikrobna ekologija
Course title:	Microbial Ecology

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

Vrsta predmeta / Course type

Izbirni/Elective

Univerzitetna koda predmeta / University course code:

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

Nosilec predmeta / Lecturer:

Marjanca STARČIČ ERJAVEC

Jeziki /

Languages:

Predavanja /

Lectures:

Vaje / Tutorial:

Slovenski

Slovene

Slovenski/Slovene

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

Prerequisites:

Jih ni.

No.

Vsebina:

Predavanja:

- Vloga mikroorganizmov v različnih naravnih (vodna in talna okolja, ekstremna okolja, prebavila vretenčarjev in nevretenčarjev) in industrijskih okoljih.
- Metode za preučevanje mikrobnih aktivnosti.
- Mikrobná raznolikost in mikrobná aktivnost v različnih naravnih okoljih, vključno z njihovimi interakcijami (znotraj in med mikrobnimi populacijami, z rastlinami, z živalmi).
- Mikrobná ekologija v vidiku »Enega zdravja«.
- Interakcije bakterij s kovinami in ksenobiotiki ter možnosti za njihovo uporabo pri bioremediaciji.
- Vpliv namernih in nenamernih izpustov mikroorganizmov v okolje, vključno z mikrobiološkimi vidiki delovanja čistilnih naprav.

Vaje:

- Mikrobné interakcije v rastlinskih koreninskih nodulih.
- Mikrobné interakcije v vzorcih prsti.
- Mikrobné interakcije v vodah in čistilnih napravah.

Terenske vaje:

- Ogleđ čistilne naprave oz. odlagališča.

Content (Syllabus outline):

Lectures:

- The role of microorganisms in different natural (water, soil, extreme environments, gut of vertebrates and nonvertebrates) and industrial environments.
- The methods for studying microbial activity will be presented.
- The microbial diversity and activities in different natural environments, including their interactions (within and with other microbial populations, with plants, with animals).
- Microbial ecology in the context of »One health«.
- Bacterial interactions with metals and xenobiotics as well as their potential use in bioremediation.
- Intentional and nonintentional release of microorganisms into the environment, including the microbiological aspects in waste water treatment systems.

Tutorial:

- Microbial interactions in plant root nodules.
- Microbial interactions in soil samples.
- Microbial interactions in water and waste water treatment plants.

Field work:

- Visit to a waste water treatment plant or a landfill.

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:

- Poznati raznolikost in razumeti vlogo mikroorganizmov v različnih okoljih.
- Razumeti potencialno nevarnost vnosa mikroorganizmov v okolje.
- Razumeti vlogo mikroorganizmov v vidiku »Enega zdravja«.Poznati možno uporabo mikroorganizmov v bioremediaciji in drugih procesih.

Objectives and competences:

- Know the diversity and understand the role of microorganism in different environments.
- Understand the potential risk of release of microorganisms into environment.
- Understand the role of microorganisms in the context of »One health«.
- Know of possible applications of microorganism in bioremediation and other processes.

Predvideni študijski rezultati:**Znanje in razumevanje:**

- Študent pojasni vlogo mikroorganizmov v različnih okoljih.
- Študent pojasni vlogo mikroorganizmov v bioremediacijskih procesih.
- Študent pojasni princip in namen uporabe različnih metod v mikrobni ekologiji.

Intended learning outcomes:**Knowledge and understanding:**

- The student explains the role of microorganisms in different environments.
- The student explains the role of microorganisms in bioremediation processes.
- The student explains the principle and purpose of using different method in microbial ecology.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Terensko delo

Learning and teaching methods:

- Lectures
- Laboratory practicals
- Field work

Delež (v %) /

Weight (in %)

Načini ocenjevanja:**Assessment:**

- Pismi izpit
- Ustna predstavitev
- Kolokvij

34
33
33

- Written exam
- Oral presentation
- Midterm exam

Reference nosilca / Lecturer's references:

1. KUZNETSOVA, Marina V., NESTEROVA, Larisa Jur'evna, MIHAILOVSKAYA, Veronika S., SELIVANOVA, Polina A., KOCHERGINA, Darja A., KARIPOVA, Marina O., VALTSIFER, Igor V., AVERKINA, Anastasia S., **STARČIČ ERJAVEC, Marjanca**. Nosocomial *Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, and *Staphylococcus aureus*: sensitivity to chlorhexidine-based biocides and prevalence of efflux pump genes. *International journal of molecular sciences*. 2025, vol. 26, issue 1, [article no.] 355, str. 1-23.
2. 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.
3. 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.
4. 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
5. 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.