Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Osnove okoljske biotehnologije
Course title:	Introduction to Environmental Biotehnology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekologija z naravovarstvom, 1. stopnja		**3.**	**6.**
Ecology with Nature Conservation, 1st level		**3rd**	**6th**

Vrsta predmeta / Course type Obvezni/Compulsory

Univerzitetna koda predmeta / University course code: **B289**

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
15	**15**				**60**	**3**

Nosilec predmeta / Lecturer: Marjanca STARČIČ ERJAVEC

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

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

Vsebina:

- Različna onesnažila v okolju in njihov vpliv;
- Uporaba mikroorganizmov za detoksifikacijo kontaminirane vode, zemlje, sedimentov in industrijskih odplak;
- Naravno prisotne mikrobne združbe v različnih ekoških nišah za zmanjševanje količine odpadkov in toksičnih snovi v okolju;
- Čistilne naprave, aerobne in anaerobne, za obdelavo tekočih in trdnih odpadnih snovi;
- Uporaba gensko spremenjenih mikroorganizmov s povečanimi odpornostmi proti ksenobiotikom za razgradnjo odpadkov;
- Etične dileme pri uporabi novih biotehnologij;
- Biokemijski in energetski vidik teh bioprocesov;
- Uporaba odpadnih surovin industrijskih procesov kot substrat za mikrobno rast in proizvodnjo uporabnih produktov (biogoriv, biološko razgradljivih izdelkov, alternativnih virov energije itd.).

Content (Syllabus outline):

- Different pollutants in the environment and their impact;
- Usage of microorganisms in detoxification of contaminated water, soil, sediments and industrial effluents;
- Natural microbial communities present in different ecological niches used for decreasing waste and toxic compounds in the environment;
- Waste treatment bioreactors, aerobic and anaerobic, for fluid and solid wastes;
- Possibilities of using genetically modified microorganisms with increased resistance against xenobiotics for waste degradation;
- Ethical concerns of using novel biotechnologies;
- Biochemical and energetic aspects of bioprocesses;
- Usage of the industrial waste as substrates for microbial growth and conversion into useful products (biogas, biologically degradable products, alternative sources of energy etc.).

Temeljni literatura in viri / Readings:

- Evans, G. M., Furlong, J. C. (2003). *Environmental biotechnology: theory and application* (str. xii, 285). J. Wiley & Sons.
- Vajdič, T. (2025). Uporaba kvasovk za bioremediacijo onesnaženih okolij. *Mikrobiolog.si*, *5*(1), 55–63. https://drive.google.com/file/d/1UQrEcvaQ_2-dQ00x3dmd7Fm9YsOVWD3V/view

Cilji in kompetence:

- Predstaviti možnosti uporabe mikrobnih združb za zmanjševanje odpadkov in toksičnih snovi v okolju;
- Študente seznaniti z različnimi biološkimi čistilnimi napravami za čiščenje odpadkov;
- Predstaviti možnost uporabe odpadnih snovi v mikrobioloških procesih za

Objectives and competences:

- Familiarity with possibilities of using natural microbial communities for decreasing the waste and diminish toxic compounds in the environment;
- Presentation of different waste treatment technologies;
- Presentation of possibilities of using waste as a substrate for production of important products.

proizvodnjo človeku koristnih produktov.	

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • Študent pozna delovanje mikrobnih sistemov, ki se uporabljajo za čiščenje odpadkov in razgradnjo toksičnih snovi; • Študent pojasni vpliv abiotskih faktorjev na delovanje čistilnih naprav.	Knowledge and understanding: • The student knows biochemical principles of microbial bioprocesses for degrading waste in the envionment; • The student explains the influence of the abiotic factors on the development of waste treatment microbial bioreactors.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminarji	• Lectures • Seminars

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Pisni izpit	50	• Written exam
• Ustna predstavitev	50	• Oral presentation

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. KUZNETSOVA, Marina V., MASLENNIKOVA, Irina L., POSPELOVA, Julia S., ŽGUR-BERTOK, Darja, **STARČIČ ERJAVEC, Marjanca**. Differences in recipient ability of uropathogenic *Escherichia coli* strains in relation with their pathogenic potential. *Infection, genetics and evolution : journal of molecular epidemiology and evolutionary genetics in infectious diseases*. Jan. 2022, vol. 97, article 105160, str. 1-8.
3. PREDOJEVIĆ, Luka, KEŠE, Darja, ŽGUR-BERTOK, Darja, ŽELEZNIK RAMUTA, Taja, VERANIČ, Peter, ERDANI-KREFT, Mateja, **STARČIČ ERJAVEC, Marjanca**. A biomimetic porcine urothelial model for assessing *Escherichia coli* pathogenicity. *Microorganisms*. 2022, vol. 10, iss. 4, str. 1-16
4. KUZNETSOVA, Marina V., MIHAILOVSKAYA, Veronika S., REMEZOVSKAYA, Natalia B., **STARČIČ ERJAVEC, Marjanca**. Bacteriocin-producing *Escherichia coli* isolated from the gastrointestinal tract of farm animals: prevalence, molecular characterization and potential for application. *Microorganisms*. 2022, vol. 10, iss. 8, str. 1-12.

5. ŽELEZNIK RAMUTA, Taja, TRATNJEK, Larisa, JANEV, Aleksandar, SEME, Katja, **STARČIČ ERJAVEC, Marjanca**, ERDANI-KREFT, Mateja. The antibacterial activity of human amniotic membrane against multidrug-resistant bacteria associated with urinary tract infections : new insights from normal and cancerous urothelial models. *Biomedicines*. 2021, vol. 9, iss. 2, str. 1-22.