



Univerza v Mariboru

Fakulteta za naravoslovje
in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Osnove biotehnologije
Course title:	Introduction to biotechnology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Univerzitetni študijski program Biologija, 1. stopnja	/	3	5
Undergraduate university programme Biology, 1 st degree	/	3	5

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Lab. vaje Laboratory work	Terenske vaje Field work	Samost. delo Individ. work	ECTS
30			30	15	105	6

Nosilec predmeta / Lecturer:

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

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

Vsebina:
Predmet je pregledna predstavitev biotehnologije, kot multidisciplinarne in interdisciplinarne znanosti. Poudarek je na uporabi biotehnologije, vplivu na okolje in človeško družbo.
Predstavljena je zgradba in podvojevanje DNK, genetsko kodiranje proteinov ter tehnike v molekularni biologiji, ki omogočajo kloniranje in gensko inženirstvo in genske manipulacije. Podaja predstavitev mikrobne biotehnologije,

Content (Syllabus outline):
The subject is an introductory course on biotechnology as multidisciplinary and interdisciplinary science. It is focused on applications and on the role in the environment and in human society.
It review DNA structure, replication and gene code for proteins and introduced techniques in molecular biology which enable to clone and engineer DNA and gene manipulations. It introduced microbial biotechnology, plant and

rastlinske in agronomske biotehnologije, bioremediacije, živalske biotehnologije, medicinske in forenzične biotehnologije. Predstavljeni bodo mikrobnii procesi, ki potekajo v proizvodnji hrane, pijač, zdravil, tudi razgradnji odpadkov. Obravnavani bodo biokemijski vidiki teh procesov, dinamika rasti mikroorganizmov, vpliv ekoloških faktorjev na njihovo namnoževanje in aktivnost ter principi nadziranja in vodenja mikrobnii procesov. Študentje se bodo seznanili z mehanizmi nadziranja in kontroliranja rasti mikroorganizmov. Predstavljene bodo rastlinske tkivne kulture in genetsko inženirstvo rastlin. Predmet omogoča osnovno razumevanje vpliva rastlinske biotehnologije na kmetijstvo, prehrano, medicino, industrijo in upravljanje z okoljem. Predmet polemizira sporne vidike biotehnologije povezane z vplivi na okolje in človeško družbo.

agricultural biotechnology, bioremediation, animal biotechnology, medical biotechnology and forensic biotechnology. Microbial processes applied in food and pharmaceutical industry as well as in the waste-treatment bioreactors will be presented. The biochemical basis of the processes will be discussed and the influence of ecological factors on the multiplication and activities of microbes involved in the processes will be presented. Students will be introduced to the principles of following and controlling microbial growth in these processes. Plant tissue cultures, and plant genetic engineering will be presented. The subject enables basic understanding of influences of plant biotechnology on agriculture, food, medicine, industry, and environmental management. Regulations, ethics and controversial aspects of biotechnology are discussed.

Temeljni literatura in viri / Readings:

Temeljna literatura / Basic literature:

Thieman W. J. in Palladino M. A., 2013. Introduction to Biotechnology, Pearson.education, Inc, publishing as Benjamin Cummings, San Francisco.

Kleyn J., Scoggins H. in Bridgen M. 2013. Plants from Test Tubes: An Introduction to Micropropagation.

Chawla H.S. 2009. Introduction To Plant Biotechnology. Oxford & IBH Publishing Company Pvt. Limited

Raspor, P. (ur.), 1996: Biotehnologija, Osnovna znanja. BIA, Ljubljana.

Priporočena literatura / Recommended readings:

Chawla, H. S., 2003: Plant Biotechnology: practical approach. Science Publishers, Enfield.

Ambrožič-Dolinšek, J., 2017. Laboratorijski priročnik za delo z rastlinskimi tkivnimi kulturami, s poudarkom na mikropropagaciji: laboratorij za fiziologijo rastlin. Maribor, Univerzitetna založba Univerze.

Reed, R., Weyers, J., Jones, A., Holmes, D. (2016, 2013) Practical Skills in Biomolecular Sciences (5th, 4th Edition). Pearson Education Ltd, Harlow, UK

Pipenbaher, N., Ambrožič-Dolinšek, J. 2014. Priročnik za delo v laboratoriju s poudarkom na varnosti: laboratorij za fiziologijo rastlin [in] laboratorij za molekularno biologijo. Maribor, Fakulteta za naravoslovje in matematiko.

Izbrani članki iz znanstvenih revij / Selected papers from scientific journals.

Cilji in kompetence:

Objectives and competences:

- Seznaniti študente z biotehnologijo kot multidisciplinarno in interdisciplinarno znanost.
- Seznaniti študente z genskimi manipulacijami, uporabo biotehnologije in različnimi področji biotehnologije.
- Usposobiti študente za prepoznavanje pomena in vpliva biotehnologije na okolje in človeško družbo.
- Seznaniti z nasprotujočimi vidiki biotehnologije.
- Praktično usposobiti študente za raziskovalno delo s področja biotehnologije.

- To acquaint students with biotechnology as a multidisciplinary and interdisciplinary science.
- To acquaint students with genetic manipulations, applications of biotechnology and different fields of biotechnology.
- To prepare students to recognize the importance and impact of biotechnology on the environment and human society.
- To prepare t students to recognize controversial aspects of biotechnology.
- Practically prepare students for research work in the field of biotechnology.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Prepozna različne tipe biotehnologije in njihovo uporabo.
- Ovrednoti vplive biotehnologije na okolje in ljudi.
- Prepoza etične , pravne, ekonomske in socialne vidike biotehnologije.
- Pojasni uporabo mikroorganizmov v različnih biotehnoloških procesih.
- Pojasni možnosti izboljšanja mikrobnih bio-procesov z genskimi in tehnološkimi pristopi.
- Pojasni biologijo gojenja rastlinskih celic.
- Pojasni genske modifikacije rastlin.
- Pojasni in primerja različne načine razstrupljanja okolja z rastlinami.
- Pojasni in primerja različne možnosti uporabe rastlin za pridobivanje biogoriv.
- Osvoji izbrane biotehnološke metode ter se usposobi za varno delo v laboratoriju.
- Osvoji osnovne spretnosti pomembne za praktično eksperimentalno delo: opazovanje, merjenje, ravnanje z rastlinskim materialom, kemikalijami, steklovino, osnovnimi aparaturami, zbiranje rezultatov, načrtovanje poskusov, vrednotenje rezultatov, poročanje.

Intended learning outcomes:

Knowledge and understanding:

- Recognizes different types of biotechnology and their application on examples of good practice.
- Evaluate the impacts of biotechnology on the environment and people.
- Understand the ethical, legal, economic and social aspects of biotechnology.
- Explain the use of microorganisms in various biotechnological processes.
- Explains the possibilities of improving microbial bioprocesses with genetic and technological approaches.
- Explain the biology of plant cell culture.
- Explains and compares the different ways of detoxifying the environment with plants.
- Explains and compares the different uses of plants for biofuel production.
- Explains the genetic modifications of plants.
- Acquire selected laboratory methods and become familiar with safe laboratory practice.
- Acquire skills important for practical experimental work: observation, measurement, handling of plant material, chemicals, glassware, basic apparatus, collection of results, planning of experiments, evaluation of results, reporting.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje
- Terensko delo

Learning and teaching methods:

- Lectures
- Laboratory exercises
- Field work

Načini ocenjevanja:

Delež (v %) /

Weight (in %)

Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):

- Pisni izpit
- Poročilo z laboratorijskih vaj*

* pogoji za pristop k izpitu.

100%

0%

Type (examination, oral, coursework, project):

- Written exam
- Laboratory exercises report*

* prerequisite for taking the exam.

Reference nosilca / Lecturer's references:

AMBROŽIČ-DOLINŠEK, Jana, ORNIK, Domen, BRANDA, Rebeka, MOLNAR, Zoltan, CIRINGER, Terezija. Does biostimulant Agrostemin® exhibit plant growth regulator activities?. *Phyton : annales rei botanicae*. 2021, vol. 61, str. 109-116. ISSN 0079-2047. DOI:

[10.12905/0380.phyton61-2022-0109](https://doi.org/10.12905/0380.phyton61-2022-0109). [COBISS.SI-ID [102044675](https://www.cobiss.si/urn:nbn:si:coibis:102044675)]

TODOROVIĆ, Biljana, GRUJIĆ, Jaša Veno, URBANEK KRAJNC, Andreja, KRANVOGL, Roman, AMBROŽIČ-DOLINŠEK, Jana. Identification and content of astaxanthin and its esters from microalgae *Haematococcus pluvialis* by HPLC-DAD and LC-QTOF-MS after extraction with various solvents. *Plants*. 2021, vol. 10, iss. 11, str. 1-14. ISSN 2223-7747. DOI:

[10.3390/plants10112413](https://doi.org/10.3390/plants10112413). [COBISS.SI-ID [84256003](https://www.cobiss.si/urn:nbn:si:coibis:84256003)]

CIRINGER, Terezija, MARTÍN, Carmen, ŠAJNA, Nina, KALIGARIČ, Mitja, AMBROŽIČ-DOLINŠEK, Jana. Cryopreservation of an endangered *Hladnikia pastinacifolia* Rchb. by shoot tip encapsulation-dehydration and encapsulation-vitrification. *In vitro cellular & developmental biology, Plant*, ISSN 1054-5476. [Print ed.], 2018, str. 1-11, ilustr., doi: [10.1007/s11627-018-9917-y](https://doi.org/10.1007/s11627-018-9917-y). [COBISS.SI-ID [23995656](https://www.cobiss.si/urn:nbn:si:coibis:23995656)]