Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Odzivi rastlinske celice na okoljske dejavnike**
Course title:	**Plant cell responses to environmental impacts**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj	**/**		
Five-year master's degree program Subject Teacher	**/**		

Vrsta predmeta / Course type Izbirni / Elective

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		**15**			**135**	**6**

Nosilec predmeta / Lecturer: Lipovšek Saša, Urbanek Krajnc Andreja

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

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

Vsebina:	**Content (Syllabus outline):**
1. Vpliv okoljskih dejavnikov na rastlinsko celico, celične tipe in celične kompartimente Spremembe v vsebnosti snovi, aktivnosti encimov, presnovi, substrukturelne spremembe celičnih organelov, spremembe v permeabiliteti biomembran, celični strukturi, DNA, celična smrt. 2. Prilagoditve rastlinske celice na okoljske dejavnike 3. Mehanizmi vzdražnosti, medcelično in celično sporočanje 4. Mehanizmi detoksifikacije 5. Mikroskopske tehnike v ekotoksikologiji in biomonitoringu	1. The environmental impact on plant cell, cell types and cell compartments Alterations in chemical compounds, enzyme activity and metabolism, substructural changes of cell organelles, changes in membrane permeability, cell structure, DNA, cell death. 2. Plant cell adaptation to environmental factors 3. Mechanisms of responding to environmental stimuli, inter- and intracellular sensing 4. Mechanisms of detoxification 5. Microscopical techniques in ecotoxicology and biomonitoring

- testni organizmi (primeri bioindikacije v okolju, pasivni in aktivni monitoring) - določanje simptomov na nivoju celičnih organelov, celic in organov kot posledica sprememb v življenjskih funkcijah rastline, - določanje in lokaliziranje akumuliranih strupenih snovi v celicah, - standardizirani testi ugotavljanja genotoksičnosti (Allium-test, Tradescantia-test). - priprava vzorcev in fiksiranje preparatov, - barvanje preparatov v svetlobni mikroskopiji, fluorescenčna barvila, imunohistokemijske in imunocitokemijske metode.	- test organisms (cases of bioindication, passive and active biomonitoring), - symptom characterization of altered life functions within cell organelles, cell and whole plant, - determination and localization of accumulated toxic compounds in cells, - standardized genotoxicology tests (Allium-Test, Tradescantia-Test). - specimen preparation and fixation protocols - staining methods in light microscopy, fluorescent - dyes, immunohistochemical and immunocytochemical methods.

Temeljni literatura in viri / Readings:

ALBERTS B., JOHNSON A., LEWIS J., RAFF M., ROBERTS K., WALTER P., 2002. Molecular Biology of the Cell. 3th, edition, Garland Science, Taylor & Francis Group, New York.

BRUNOLD CH., RÜEGSEGGER A., BRÄNDLE R., 1996. Stress bei Pflanzen. Verlag Paul Haupt, Stuttgart.

GRILL D., TAUSZ M., DE KOK L. J., 2001. Significance of glutathione to plant adaptation to the environment. Kluwer academic publishers, Dordrecht.

KLEINIG H., SITTE P., 1999. Zellbiologie. 4. Aufl., Gustav Fischer Verlag, Stuttgart.

LARCHER W., 1991. Physiological Plant Ecology. Springer, Heidelberg.
SITTE P., WEILER E.W., KADEREIT J.W., BRESINSKY A., KÖRNER C. 2002. Lehrbuch der Botanik für Hochschulen. Begründet von Strasburger E., Noll F., Schenck H., Schimper. Spectrum Akademischer Verlag Heidelberg, Berlin.

POLLARD in sod., Cell biology, Spektrum, 2008.

Cilji in kompetence:	**Objectives and competences:**
1. Predstavitev zgradbe rastlinske celice, kemične sestave in mehanizma transporta snovi v celici. 2. Pregled vpliva okoljskih dejavnikov na celične tipe in celične kompartimente. 3. Ponazoritev mehanizmov vzdražnosti ter mehanizmov medceličnega in celičnega sporočanja. 4. Predstavitev nekaterih prilagoditev rastlinske celice na stresne dejavnike in predstavitev mehanizmov detoksifikacije. 5. Uporaba metod celične biologije na področju okoljskega monitoringa in ekotoksikologije.	1. Introduction to the structure, chemical composition and transport mechanisms of plant cell. 2. Overview of the impacts of environmental factors on cell types and cell compartments. 3. Insights about the mechanisms of perception and mechanisms of inter- and intracellular sensing. 4. Presentation of some adaptations to stress factors on the cell level and mechanisms of detoxification. 5. Application of methods in environmental monitoring and ecotoxicology.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: . Razumevanje in prepoznavanje celičnih sprememb zaradi vpliva stresnih dejavnikov.	**Knowledge and understanding:** 1. Understanding and recognition of alterations within cells affected by stress factors.

2. Osvojitev principov mikroskopije in osnovnih metod v rastlinski celični biologiji. 3. Poznavanje pomena celične biologije v okoljskem monitoringu in ekotoksikologiji. **Prenesljive/ključne spretnosti in drugi atributi:** 1.Prepoznavanje vpliva okoljskih dejavnikov na strukturo in delovanje celic. 2. Sposobnost uporabe citoloških metod v okoljskem monitoringu in ekotoksikologiji.	2. Capturing principles of microscopy and basic methods in plant cell biology. 3. Throughout knowledge about the significance of cell biology in environmental monitoring and ecotoxicology. **Transferable/Key Skills and other attributes:** 1. Identification of the impacts of environmental factors on the plant cell structure and function. 2. Ability for using cytological methods in ecological monitoring and ecotoxicology.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• predavanja z aplikativnimi primeri principov in metod celične biologije ob uporabi različnih AV sredstev, • eksperimentalne vaje, • samostojno delo študentov v obliki seminarjev.	• lectures with special attention to principles and methods in cell biology by using audiovisual equipment, • experimental work, • independent student work in form of seminars;

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• pisni izpit	60	• written examination
• seminarska naloga	40	• project work

Reference nosilca / Lecturer's references:

1. IVANČIČ, Anton, ROUPSARD, Olivier, QUERO, Garcia José, ŠIŠKO, Metka, URBANEK KRAJNC, Andreja, LEBOT, Vincent. Topology of thermogenic tissues of Alocasia macrorrhizos (Araceae) inflorescences. *Botany*. [Tiskana izd.], 2009, letn. 87, št. 12, str. 1232-1241. [COBISS.SI-ID 2900524]

2. URBANEK KRAJNC, Andreja. A Temporal analysis of antioxidative defense responses in the phloem of Picea abies after attack by Ips typographus. *Tree physiol.*, 2009, vol. 29, issue 8, str. 1059-1068. http://treephys.oxfordjournals.org/content/29/8/1059.full.pdf+html, doi: 10.1093/treephys/tpp041. [COBISS.SI-ID 2877740]

3. URBANEK KRAJNC, Andreja, ZECHMANN, Bernd, WONISCH, A., MÜLLER, Maria. Elevated thiol levels affect virus infection in Cucurbita pepo plants regenerated via somatic embryogenesis. *Acta phytopathol. entomol. Hung.*, 2007, letn. 42, št. 1, str. 253-271. [COBISS.SI-ID 2569772]

4. ZECHMANN, Bernd, ZELLNIG, Günther, URBANEK KRAJNC, Andreja, MÜLLER, Maria. Artificial elevation of glutathione affects symtom development in ZYMV-infected Cucurbita pepo L. plants. *Arch. virol.*, 2007, letn. 152, str. 747-762. [COBISS.SI-ID 2569516]

5. MÜLLER, Maria, ZELLNIG, Günther, URBANEK KRAJNC, Andreja, ZECHMANN, Bernd. Recent developments in methods intracellulary localizing glutathione within plant tissue and cells : (a minireview). *Phyton (Horn)*, 2005, letn. 45, št. 3, str. 45-55. [COBISS.SI-ID 2387244]