Univerza v Mariboru
University of Maribor

Fakulteta za naravoslovje in matematiko
Faculty of Natural Sciences and Mathematics

OPIS PREDMETA / SUBJECT SPECIFICATION	
Predmet: **Subject Title:**	**Odzivi rastlinske celice na okoljske dejavnike** / **Plant Cell Responses to Environmental Impacts**

Študijski program Study programme	Študijska smer Study field	Letnik Year	Semester Semester
Biologija/Biology	Biologija/Biology	3	zimski ali letni

Univerzitetna koda predmeta / University subject code:

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

Nosilec predmeta / Lecturer: Andreja URBANEK KRAJNC, Saška LIPOVŠEK

Jeziki / Languages:	
Predavanja / Lecture:	slovenski / Slovenian
Vaje / Tutorial:	slovenski / Slovenian

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

Prerequisites:

Vsebina:

1. Vpliv okoljskih dejavnikov na rastlinsko celico, celične tipe in celične kompartimente; spremembe v vsebnosti snovi, aktivnosti encimov, presnovi, substrukturalne spremembe celičnih organelov, spremembe v permeabilnosti 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
- testni organizmi (primeri bioindikacije v okolju, pasivni in aktivni monitoring),

Contents (Syllabus outline):

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:
- test organisms (cases of bioindication, passive and active biomonitoring),
- symptom characterization of altered life functions within cell organelles, cell and whole plant,

- 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	- 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 študijski viri / Textbooks:

- Alberts, B., A. Johnson, J. Lewis, M. Raff, K. Roberts, P. Walter , 2002: Molecular Biology of the Cell. 3th, edition, Garland Science, Taylor & Francis Group, New York.
- Brunold, Ch., A. Rüegsegger , R. Brändle , 1996: Stress bei Pflanzen. Verlag Paul Haupt, Stuttgart.
- Grill, D., M. Tausz, L. J. De Kok, 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., E. W. Weiler, J. W. Kadereit, A. Bresinsky, C. Körner, 2002: Lehrbuch der Botanik für Hochschulen. Begründet von Strasburger E., Noll F., Schenck H., Schimper. Spectrum Akademischer Verlag Heidelberg, Berlin.

Cilji:	**Objectives:**
• Predstavitev zgradbe rastlinske celice, kemijske sestave in mehanizma transporta snovi v celici. • Pregled vpliva okoljskih dejavnikov na celične tipe in celične kompartimente. • Ponazoritev mehanizmov vzdražnosti ter mehanizmov medceličnega in celičnega sporočanja. • Predstavitev nekaterih prilagoditev rastlinske celice na stresne dejavnike in predstavitev mehanizmov detoksifikacije. • Uporaba metod celične biologije na področju okoljskega monitoringa in ekotoksikologije.	• Introduction to the structure, chemical composition and transport mechanisms of plant cell. • Overview of the impacts of environmental factors on cell types and cell compartments. • Insights about the mechanisms of perception and mechanisms of inter- and intracellular sensing. • Presentation of some adaptations to stress factors on the cell level and mechanisms of detoxification. • 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. • Osvojitev principov mikroskopije in osnovnih metod v rastlinski celični biologiji.	Knowledge and Understanding: • Understanding and recognition of alterations within cells affected by stress factors. • Capturing principles of microscopy and basic methods in plant cell biology. • Throughout knowledge about the

• Poznavanje pomena celične biologije v okoljskem monitoringu in ekotoksikologiji. Prenesljive/ključne spretnosti in drugi atributi: • Prepoznavanje vpliva okoljskih dejavnikov na strukturo in delovanje celic. • Sposobnost uporabe citoloških metod v okoljskem monitoringu in ekotoksikologiji.	significance of cell biology in environmental monitoring and ecotoxicology. Transferable/Key Skills and other attributes: • Identification of the impacts of environmental factors on the plant cell structure and function. • Ability of using cytological methods in ecological monitoring and ecotoxicology.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Eksperimentalne vaje • Samostojno delo študentov v obliki seminarjev	• Lectures • Experimental work • Individual student work in form of seminars

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Pisni izpit • Ustni kolokvij • Seminarska naloga	60 30 10	• Written examination • Oral examination • Seminar work

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Materialni pogoji za izvedbo predmeta :	***Material conditions for subject realization***
• *Multimedijska predavalnica* • *Laboratorij za izvedbo laboratorijskih vaj z ustrezno opremo (svetlobni mikroskop, pH-meter, centrifuga, tehnica, kuhalnik, steklovina, kemikalije)*	• *Lecture hall for multimedia presentations* • *Laboratory with appropriate equipment (light microscope, pH-meter, centrifuge,scale, cooker, laboratory glassware, chemicals)*

Obveznosti študentov:	***Students' commitments:***
(pisni, ustni izpit, naloge, projekti)	*(written, oral examination, coursework, projects):*
• Seminarska naloga • Ustna predstavitev rezultatov po opravljenih vajah • Pisni izpit	• Seminar work • Oral presentation of laboratory results • Written examination