UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	TOKSIKOLOGIJA
Course title:	TOXICOLOGY

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Varstvo okolja in ekotehnologije, 2. stopnja	/	2.	/
Environmental Protection and Eco-technologies, 2nd level	/	2nd	/

Vrsta predmeta / Course type	Izbirni predmet / Optional course
Univerzitetna koda predmeta / University course code:	BTOX

Predavanja Lectures	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
20	20	/	/	80	**4**

Nosilec predmeta / Lecturer:	red. prof. dr. Bojan Sedmak
Jeziki / Languages: Predavanja / Lectures:	Slovenščina / Slovenian
Vaje / Tutorial:	Slovenščina / Slovenian

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Pogojev ni.	No formal prerequisites.

Vsebina:	**Content (Syllabus outline):**
Osnovna toksikološka načela, razmerje med odmerkom in odzivom, razmerja med izpostavljenostjo inodzivom, metabolizem toksinov, toksičnost za ciljne organe. **Poglavitne teme:** • Osnovni predpogoji pri uporabi UI in uporaba UI v toksikologiji. • Uvod – (zgodovina, tipi toksičnih snovi). • Distribucija toksičnih snovi – (absorbcija, distribucija, metabolizem). • Odgovor na prisotnost toksinov. • Metabolizem toksičnih snovi – (tipi metabolnih sprememb, reakcije 1. faze, reakcije 2. faze, nadzor metabolizma, zastrupitev proti razstrupitvi. • Toksičnost zdravil. • Aditivi in kontaminanti. • Industrijska toksikologija. • Pesticidi. • Toksične snovi v gospodinjstvu.	Basic principles of toxicology, dose-response relationship, exposure-response relationships, toxin metabolism, target organ toxicity **Main topics:** • Basic prerequisites for the use of AI and the use of AI in toxicology • Introduction – (History, Types of toxic substances). • Disposition of toxic substances – (Absorption, Distribution, Metabolism). • Toxic responses to foreign compounds.• Metabolism of toxic compounds – (Types of metabolic change, Phase 1 reactions, Phase 2 reactions, Control of metabolism, Toxication vs. detoxication). • Drugs as toxins. • Food additives and contaminants. • Industrial toxicology. • Pesticides. • Household products. • Natural products.

• Naravni produkti. • Biokemijski mehanizmi toksičnosti – primeri.	•Biochemical mechanisms of toxicity – specific examples.

Temeljna literatura in viri / Textbooks:

Obvezna / Required:
Študijsko gradivo v obliki izročkov

Priporočena / Recommended:
1. J.A. Timbrell (2002). Introduction to toxicology. CRC, 3rd Ed.
2. Izbrana poglavja / Selected chapters:
   J.A. Timbrell (2003). Principles of Biochemical Toxicology. Taylor&Francis.
   Casarett and Dull's Toxicology (2001). The basic Science of Poisons. (Ed. Klaasen C.D.), McGraw-Hill 6th Ed.

Cilji in kompetence:	**Objectives and competences:**
Predmetno specifični cilji in kompetence: Seznaniti študente z osnovami toksikologije in biokemijskih mehanizmov toksičnosti. **Splošne kompetence:** Usposobiti študente za obvladovanje nalog, prepoznavanje in reševanje problemov na področju toksikologije ter jih spodbuditi k samostojnemu učenju.	**Specific competences:** To acquaint the students with basic toxicology and the biochemical mechanisms of toxicity. **General competences:** To qualify student to manage tasks, to identify and solve problems in the field of toxicology and to encourage them to undertake independent learning.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študent bo ob zaključku predmeta sposoben - izkazati poznavanje osnov toksikologije, - prepoznavati toksikološke probleme in jih reševati, - uporabiti primerna orodja za rešitev problema, - razumeti mehanizme toksičnosti in opredeliti možne ciljne organe, - bo seznanjen z biološko vlogo toksinov pri njihovi uporabi kot molekularna orodja, - pokazati sposobnost zbiranja in razvrščanja različnih zamisli in informacij s področja toksikologije.	**Knowledge and understanding:** At the end of the subject, student will be able: - to demonstrate a foundation of underpinning knowledge in basic toxicology, - to recognize toxicological problems and be able to understand and solve them, - to chose appropriate tools to solve the problem, - to understand the mechanisms of toxicity and define the possible target organs, - be acquainted with the biological role of toxins used as molecular tools, - be able demonstrate the ability to collect and categorize ideas and information in the field of toxicology.
Prenosljive/ključne spretnosti in drugi atributi: Sposobnost opravljanja lastne vloge. odgovornosti in razpolaganje s časom. Sposobnost neodvisnega učenja. Sposobnost pisne in ustne komunikacije. Sposobnost uporabe informacijskih tehnologij. Sposobnost skupinskega dela.	**Transferable/key skills and other attributes:** The management of own roles, responsibilities and time. The ability to undertake independent learning. Effective communication verbal and written. The ability to demonstrate competency in IT skills. The ability of working in team.

Metode poučevanja in učenja:	Learning and teaching methods:
Oblike dela: • Predavanja • Seminarske vaje **Metode dela:** • Problemsko učenje • Analiza globalnih primerov • Skupinsko in individualno delo…	**Forms of teaching:** • Lectures • Seminar **Teaching methods:** • Problem-based learning • Case study – globally relevant events • Group and individual work

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Pogoj za pristop k izpitu: Prisotnost (udeležba) na seminarskih vajah in pravočasno oddana in pozitivno ocenjena analiza študije primera. Končna ocena pri predmetu je sestavljena iz: • pisni oz. ustni izpit • in ocena PBL (rešitev problema, pisni izdelek, njegova predstavitev). Ocenjevalna lestvica: ▪ zadostno 6: 60–67 % ▪ dobro 7: 68–75 % ▪ prav dobro 8: 76–83 % ▪ prav dobro 9: 84–90 % ▪ odlično 10: 91–100 %	 **60** **40**	A prerequisite for access to the exam: Attendance (participation) at seminar tutorial and a timely and positively assessed case study analysis. Final evaluation consists of knowledge testing: • written or oral exam • and a PBL assessment (problem solution, written product, its presentation). Grading scale: ▪ Sufficient D (6): 60–67% ▪ Good C (7): 68–75% ▪ Very good B (8): 76–83% ▪ Very good B+ (9): 84–90% ▪ Excellent A (10): 91–100%

Materialni pogoji za izvedbo predmeta :	Material conditions for subject realization:
• Predavalnica z multimedijsko opremo in računalniška učilnica.	• A lecture hall with multimedia equipment and a computer lab.

Obveznosti študentov:	Student's commitments:
Obvezna udeležba seminarskih vaj, pozitivno ocenjeno delo in zagovor ter pisni ali ustni izpit	Mandatory active participation at the coursework (seminar), its defence and a positive written or oral exam.

Reference nosilca predmeta:	Lecturer's references:
Pedagoško delo: • Nosilec dveh predmetov na FVO (toksikologija in ekotoksikologija. **Znanstveno-raziskovalno delo:** • Znanstveno – raziskovalno delo na globalnih toksikoloških in ekotoksikoloških problemih, kot so cvetenja morja in celinksih voda, učinki toksinov, odkrivanje novih biološko aktivnih snovi,…	**Pedagogic activities:** • Holder of two courses at the FVO (toxicology and ecotoxicology. **Scientific and research work:** • Scientific research work on global toxicological and ecotoxicological problems, such as marine and freshwater blooms, effects of toxins, discovery of new biologically active substances, etc.

Strokovno delo in izbrane strokovne publikacije:

SEDMAK, Bojan, LAKOVIČ, Gorazd, LEŠTAN, Domen, MEGLIČ, Andrej, GERL, Marko. *Method and system for simultaneous detection of micro-particle concentration in suspension and their morphological and physiological traits : new European patent application no. EP 15161547.3*

LEŠTAN, Domen, SEDMAK, Bojan, LAKOVIČ, Gorazd. *Preprečevanje masovnega pojavljanja škodljivih cianobakterij : patent št. 23987 (A), 2013-08-30*. Ljubljana: Urad RS za intelektualno lastnino, 2013. 5 str., [ilustr.]. [COBISS.SI-ID 2885199]
patentna družina: WO2013115732 (A2), 20130-08-08

Priznanja in nagrade:

- številne

Professional work and selected professional publications:

SEDMAK, Bojan, LAKOVIČ, Gorazd, LEŠTAN, Domen, MEGLIČ, Andrej, GERL, Marko. *Method and system for simultaneous detection of micro-particle concentration in suspension and their morphological and physiological traits : new European patent application no. EP 15161547.3*

LEŠTAN, Domen, SEDMAK, Bojan, LAKOVIČ, Gorazd. *Preprečevanje masovnega pojavljanja škodljivih cianobakterij : patent št. 23987 (A), 2013-08-30*. Ljubljana: Urad RS za intelektualno lastnino, 2013. 5 str., [ilustr.]. [COBISS.SI-ID 2885199]
patentna družina: WO2013115732 (A2), 20130-08-08

Awards:

- various

Izbrani znanstveni članki / Selected **scientific papers:**

B Sedmak, N Fanuko (1991): Occurrence of Dinophysis spp. and toxic shellfish in the Northern Adriatic Journal of applied phycology, Springer

B. Sedmak, T. Eleršek (2005): Microcystins induce morphological and physiological changes in selected representative phytoplanktons. Microbial ecology, Springer

B. Sedmak, G. Kosi (1998):The role of microcystins in heavy cyanobacterial bloom formation. Journal of Plankton Research

A. Bubik, R. Frangež , M C. Žužek, I. Gutiérrez-Aguirre, T. T. Lah and **B. Sedmak** (2024): Cyanobacterial cyclic peptides can disrupt cytoskeleton organization in human astrocytes—A contribution to the understanding of the systemic toxicity of cyanotoxins. Toxins