

## UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Kemijska in prehranska toksikologija
<b>Course title:</b>	Chemical and Food Toxicology

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekotehnologije, 3. stopnja	/	1	1
Ecotechnologies, 3 <sup>rd</sup> cycle	/	1	1

**Vrsta predmeta / Course type** Izbirni / Elective

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

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje work	Druge oblike študija	Samost. delo Individ. work	ECTS
15	15			15	105	5

*\*Navedena porazdelitev ur velja, če je vpisanih vsaj 15 študentov. Drugače se obseg izvedbe kontaktnih ur sorazmerno zmanjša in prenese v samostojno delo. / This distribution of hours is valid if at least 15 students are enrolled. Otherwise the contact hours are linearly reduced and transferred to individual work.*

**Nosilec predmeta / Lecturer:** Prof. dr. Metka Filipič  
Doc. dr. Bojana Žegura

**Jeziki / Languages:** **Predavanja / Lectures:** slovenski / angleški  
Slovene / English

**Vaje / Tutorial:** slovenski / angleški  
Slovene / English

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

Zaključen študij druge stopnje naravoslovne ali tehniške smeri ali zaključen študij drugih smeri z dokazanim poznavanjem osnov področja predmeta (pisna dokazila, pogovor).

**Prerequisites:**

Completed second level studies in natural sciences or engineering or completed second level studies in other fields with proven knowledge of fundamentals in the field of this course (certificates, interview).

**Vsebina:**

- Uvod v toksikologijo: osnovni koncepti nevarnosti in toksičnosti, povezava med dozo in učinki - zdravila, strupi in nutrienti, naravne in sintetične kemikalije, homeostaza preprečevanje zastrupitev.
- Dejavniki, ki vplivajo na tveganje za zastrupitve: kako snovi krožijo v okolju, odvisnost dejanske izpostavljenosti od vrste izpostavljenosti, odvisnost toksičnih učinkov od interakcij kemikalije v telesu (toksikokinetika, toksikodinamika), učinki na organe, posebni učinki (karcinogeneza, mutageneza,

**Content (Syllabus outline):**

- Introduction: basic concepts of hazard and toxicity, dose-response relationships – drugs, poisons and nutrients, natural and synthetic chemicals, homeostasis, avoiding poisoning.
- Factors affecting risk of poisoning: how substances move through environment, how effective exposure depends on the route of exposure, how toxic effects depend upon how the body reacts with chemicals (toxicokinetics, toxicodynamics), effects on organs, specific toxic effects (carcinogenesis, mutagenesis, reproductive toxicity, immunotoxicity) and their

reproduktivna toksičnost, imunotoksičnost) in njihovi molekularni mehanizmi, učinki kombiniranih izpostavljenosti, razlike med akutnimi in kroničnimi izpostavljenostmi.

3. Viri in uporaba toksikoloških podatkov: toksikološki testi (in vivo, in vitro, toksikogenomika) interpretacija podatkov, ocena nevarnosti, monitoring izpostavljenosti.

4. Vrste kemikalij in onesnažil živil, ki vplivajo na zdravje: topila, kovine, kisline in baze, pesticidi, nanodelci, naravni toksini, aditivi hrani, produkti, ki nastanejo pri predelavi živil.

molecular mechanisms, effects of combined exposures, differences between acute and chronic exposure.

3. Sources and use of toxicological data: Toxicological testing (in vivo, in vitro, toxicogenomics), interpretation of data, hazard assessment, exposure monitoring.

4. Common types of chemicals and food contaminants that cause health threats: solvents, metals, acids and bases, pesticides, nanoparticles, natural toxins, food additives, side products of food processing.

### Temeljna literatura in viri / Readings:

C.D. Klaasen editor. Casarett and Doull's Toxicology: 7th edition, McGraw-Hill, 2008 (izbrana poglavja/selected chapters)

J.A. Timbrell, "Principles of Biochemical Toxicology, Fourth Edition," Informa Healthcare, New York (2008).

Introduction to Food Toxicology T. Shibamoto and L. Bjeldanes (2nd Ed 2009) Academic Press, Inc. San Diego, CA

Pregledni članki s področja, tekoča periodika, spletna stran EU, druga učna gradiva... / review articles from the field, periodicals, EU website, other educational readings...

### Cilji in kompetence:

- Razumevanje osnovnih toksikoloških principov
- Razumevanje različnih vrst škodljivih učinkov zaradi izpostavljenosti toksičnim kemikalijam
- Razumevanje različnih mehanizmov delovanja toksičnih kemikalij
- Razumevanje vrst izpostavljenosti toksičnim snovem
- Razumevanje in uporaba toksikoloških podatkov
- Razumevanje koncepta ocenjevanja tveganja za zdravje ljudi

### Objectives and competences:

- Understanding basic toxicological principles
- Understanding different types of adverse effects of the exposure to toxic chemicals
- Understanding different mechanisms of action of toxic chemicals
- Understanding the types of exposure to toxic compounds
- Understanding and use of toxicological data
- Understanding the concept of risk assessment for human health

### Predvideni študijski rezultati:

- Samostojno tolmačenje kompleksnih toksikoloških procesov
- Pridobivanje toksikoloških podatkov
- Kritično ocenjevanje toksikoloških in epidemioloških podatkov
- Ocenjevanje tveganj zaradi izpostavljenosti toksičnim snovem.

### Intended learning outcomes:

- Independent evaluation of complex toxicological processes
- Acquiring toxicological data
- Critical assessment of toxicological and epidemiological data
- Assessment of risk upon exposures to toxic compounds.

### Metode poučevanja in učenja:

Predavanja  
Priprava seminarjev

### Learning and teaching methods:

Lectures  
Seminars

<b>Načini ocenjevanja:</b>	<b>Delež (v %) / Weight (in %)</b>	<b>Assessment:</b>
Seminar	50 %	Seminars
Ustni zagovor seminarske naloge	50 %	Oral defence of seminar work

**Reference nosilca / Lecturer's references:**

<ul style="list-style-type: none"> <li>- Novak, M, Žegura, B, Nunić, J, Gajski, G, Gerić, M, Garaj-Vrhovac, V, Filipič, M. (2017) Assessment of the genotoxicity of the tyrosine kinase inhibitor imatinib mesylate in cultured fish and human cells. Mutation research, Genetic toxicology and environmental mutagenesis, 814, 14-21,</li> <li>- Gajski, G., Geric, M., Žegura, B., Novak, M., Nunić, J., Bajrektarević, D., Garaj-Vrhovac, V., and Filipič, M. (2016). Genotoxic potential of selected cytostatic drugs in human and zebrafish cells. Environmental Science and Pollution Research, 23, 14739-14752.</li> <li>- Kovacs, R., Csenki, Z., Bakos, K., Urbanyi, B., Horvath, A., Garaj-Vrhovac, V., Gajski, G., Geric, M., Negreira, N., Lopez de Alda, M., Barcelo, D., Heath, E., Kosjek, T., Žegura, B., Novak, M., Zajc, I., Baebler, Š., Rotter, A., Ramšak, Ž., Filipič, M. (2015). Assessment of toxicity and genotoxicity of low doses of 5-fluorouracil in zebrafish (Danio rerio) two-generation study. Water Research 77, 201-212.</li> <li>- Maisanaba Hernández, G., Hercog, K., Filipič, M., Jos, A., Žegura, B. (2016) Genotoxic potential of Montmorillonite clay mineral and alteration in the expression of genes involved in toxicity mechanisms in the human hepatoma cell line HepG2. Journal of hazardous materials,. 304, 425-433.</li> <li>- Novotnik, B., Ščančar, J., Milačič, R., Filipič, M., Žegura, B. Cytotoxic and genotoxic potential of Cr(VI), Cr(III)-nitrate and Cr(III)-EDTA complex in human hepatoma (HepG2) cells. (2016) Chemosphere, 154, 124-131.</li> </ul>
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