Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Izbrana poglavja iz nevarnih snovi v bivalnem okolju**
Course title:	**Selected Topics in Pollutants in Living Environment**

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Doktorski študij Ekološke znanosti, 3. stopnja		**1. ali 2.; 1st or 2nd**	**1., 2. ali 3.; 1st or 2nd or 3rd**
Doctoral Study Ecological Sciences, 3rd degree			

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
5	**5**				**140**	**5**

Nosilec predmeta / Lecturer:	Ernest VONČINA

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

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje biologije, ekologije in biokemije na ravni univerzitetnega programa	Knowledge of biology, ecology and biochemistry at graduate level

Vsebina:	**Content (Syllabus outline):**
Obravnavana so izbrana poglavja iz naslednjih sklopov. Predmet obravnava problematiko onesnaževanja okolja z organskimi spojinami. Podaja in opisuje eksterno in interno izpostavljenost človeka v bivalnem okolju s kontaminanti. Poudarja pomembnost izpostavljenosti za okoljsko ozadje značilnim	Selected topics in the following chapters are discussed. Understanding the environment pollution with hazardous substances. The subject explains external and internal exposure of humans to pollutants and the importance of exposure to background pollutant concentrations in living environment.

koncentracijam nevarnih spojin v bivalnem in širšem okolju. Razumevanje vpliva onesnažil na bivalno okolje in na zdravje ljudi je pomembno za ohranjanje čistega okolja. Pri predmetu se študenti seznanijo z nevarnimi spojinami, ki so predvsem posledica antropogenega vpliva na okolje. Seznanijo se z metodami za ugotavljanje vsebnosti onesnaži in njihovih razgradnih produktov v okolju. Predmet obravnava onesnažila kot so policiklični aromatski ogljikovodiki, nitrozamini, fenolne spojine, pesticidi in tradicionalni organoklorni insekticidi, onesnažila s področja tehničnih kemikalij kot so estri ftalne in fosforjeve kisline, poliklorirani naftaleni, bifenili, dioksini in furani, polibromirani difenil etri vključno z perfluoriranimi spojinami površinsko aktivnih snovi. Predmet podaja porazdeljevanje spojin v okolju (zrak, voda, sediment/zemlja), njihovo obstojnost, globalno razširjenost, biotsko koncentriranje in razgradnjo, ter daje pregled nad potencialno nevarnostjo, ki jo predstavljajo. Predmet obravnava pomembnejše spojine, ki onesnažujejo (spreminjajo) okolje predvsem kot motilci naravnega hormonalnega (endokrinega) ravnotežja človeka. Sem spadajo naravne estrogene spojine in spojine, ki jih je proizvedel človek hote za potrebe industrije in kmetijstva ter spojine, ki nastajajo nehote, kot stranski produkti industrijskih procesov. Pri predavanjih so obravnavane posamezne skupine organskih onesnažil okolja: • Kemijska opredelitev spojin z njihovimi fizikalno-kemijskmi lastnostmi kot skupinskimi parametri • S fizikalno-kemijskimi lastnostmi podprto porazdeljevanje spojin v okolju (voda, zrak, sediment) • Različne poti vstopanja predstavljenih spojin v okolje in možnosti ter sposobnosti okolja za njihovo razgradnjo • Poti vstopanja spojin v prehranjevalno verigo človeka in nevarnosti, ki jo predstavljajo za njegovo zdravje	Understanding influence of pollutants on the environment and human health is essential for preserving clear environment. Students are acquainted with hazardous substances which are mostly a consequence of anthropogenic impact on environments. They gain knowledge of methods for determination of pollutants and their degradation products in the environment. The subject is dealing with pollutants such as: polycyclic aromatic hydrocarbons, nitrozamines, phenolic compounds, pesticides and traditional organochloric insecticides, esters of phtalic and phosphoric acids as technical chemicals pollutants, polychlorinated naphtalenes, biphenyls, dioxins and furans, polybrominated diphenyl ethers including perfluorinated substances of surface active compounds. Subject is discussing the distribution of hazardous substances in environment (air, water, sediment/soil), their persistence, global distribution, biotic concentration and degradation. It surveys potential risk of hazardous substances. Subject gives knowledge on important substances which can modify environment especially as disruptors of natural hormonal endocrinal equilibrium of human organism. These substances are natural estrogen compounds and substances made by human for use in industry and agriculture, and substances made unintentionally as byproducts in industrial processes. The subject addresses particular groups of environmental organic pollutants: • Chemical identification of sibstances by their physical and chemical properties as grouping parameters. • Distribution of substances in environment (water, air, sediment) on the base of their physical- chemical properties. • Different modes of introducing hazardous substances into environment and environment ability for their degradation. • Mode of incoming of substances into the food chain of humans and risks for human health.

• Poti razširjanja in preprečevanja razširjanja nevarnih spojin v okolje • Različni analitski postopki za določevanje organskih onesnažil • Predavanja bodo širila zavest o pomembnosti ohranjanja zdravega okolja	• Modes of distribution and prevention of distribution of hazardous substances into environment. • Different analytical methods for determination of organic pollutants. • The subject will help to propagate ideas of importance to preserve clear environment.

Temeljni literatura in viri / Readings:

- Baird, C., 1995: Environmental Chemistry, New York.
- Colborn, T., D. Dumanoski, J. P.Myers, 1996: Our Stolen Future, A Dutton Book, Penguin Group.
- Fellenberg, G., 2000: The Chemistry of pollution, John Willey and Sons, LTD, Chichester, New York.
- Hutzinger, O. 1984: The Handbook of Environmental Chemistry, The Natural Environment and Biogeo-chemical Cycles,Springer-Verlag, Berlin, Heidelberg.
- Moore, J. W. , 1991: Inorganic Contaminants of surface water, Research and monitoring priorities, Springer –Verlag.

Cilji in kompetence:	**Objectives and competences:**
Študenti • Podrobno razumejo metode, ki so v uporabi v moderni okoljski kemiji za odkrivanje in določanje vsebnosti nevarnih snovi in njihovih razgradnih produktov v okolju • Podrobno usvojijo temeljno in poglobljeno znanje o prisotnosti nevarnih snovi v okolju • Podrobno spoznajo principe delovanja nevarnih snovi na človeka • Podrobno spoznajo področja uporabe znanj o vplivu nevarnih snovi na okolje • Podrobno spoznajo principe preprečevanja onesnaževanja	Students: • Understand in detail methods used in modern environmental chemistry for detecting and determinating the contents of hazardous substances and their degaradation products in environments • They acquire advanced knowledge necessary to study the occurence of hazardous substances in environment • They get advanced knowledge of principles of influences of hazardous substances on humans • They get advanced knowledge of fields where knowledge of hazardous substances influences on environment can be applied • They are acquainted with advanced principles of prevention of contamination

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: Študenti • Podrobno razumejo metode v okoljski kemiji • Podrobno usvojijo temeljno in poglobljeno	**Knowledge and understanding:** Students: • Understand in detail methods used in modern environmental chemistry • Acquire advanced knowledge of hazardous

znanje s področja nevarnih snovi v okolju • Podrobno razumejo znanja okoljske kemije, ki so nujno potrebna na drugih področjih obravnave okolja • Podrobno spoznajo področja, na katerih se aplicirajo znanje o nevarnih snoveh v okolju **Prenesljive/ključne spretnosti in drugi atributi:** Študenti • Pridobijo podrobne izkušnje in laboratorijske spretnosti, ki so nujno potrebne pri samostojnem laboratorijskem delu • So sposobni podrobno razumeti znanstvene prispevke in zahtevnejšo študijsko literaturo	substances in environment • Understand in detail the knowledge of environmental chemistry essential for other subjects in the field of environment • Gain advanced knowledge of areas in which knowledge of hazardous substances in environment is applied **Transferable/Key Skills and other attributes:** Students: • Acquire advanced experience and laboratory skills which are essential for an autonomous laboratory work • They are able to understand in detail articles advanced scientific articles and text-books

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Laboratorijske vaje • Seminarska naloga	• Lectures • Laboratory excersises • Seminar essay

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
• Laboratorijski dnevnik • Kolokvij iz analiznih metod • Pisni izpit	20 % 40 % 40 %	• Diary of laboratory exercises • Partial exam of analytical methods • Written exam

Reference nosilca / Lecturer's references:

1. KRANVOGL, Roman, KNEZ, Jure, MIUC, Alen, VONČINA, Ernest, BRODNJAK-VONČINA, Darinka, VLAISAVLJEVIĆ, Veljko. Simultaneous determination of phthalates, their metabolites, alkylphenols and bisphenol a using GC-MS in urine of men with fertility problems. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2014, vol. 61, no. 1, str. 110-120. http://acta.chem-soc.si/61/61-1-110.pdf. [COBISS.SI-ID 17710102]

2. KNEZ, Jure, KRANVOGL, Roman, BREZNIK, Barbara, VONČINA, Ernest, VLAISAVLJEVIĆ, Veljko. Are urinary bisphenol A levels in men related to semen quality and embryo development after medically assisted reproduction?. *Fertility and sterility*, ISSN 0015-0282. [Print ed.], Jan. 2014, vol. 101, no. 1, str. 215-221. http://www.sciencedirect.com/science/article/pii/S0015028213031026#, doi: 10.1016/j.fertnstert.2013.09.030. [COBISS.SI-ID 4809023]

3. PAVŠIČ, Primož, MLADENOVIČ, Ana, MAUKO, Alenka, KRAMAR, Sabina, DOLENEC, Matej, VONČINA, Ernest, PAVŠIČ VRTAČ, Katarina, BUKOVEC, Peter. Sewage sludge / biomass ash based products for sustainable construction. *Journal of cleaner production*, ISSN 0959-6526. [Print ed.], 2013. http://www.sciencedirect.com/science/article/pii/S0959652613008883, doi:

dx.doi.org/10.1016/j.jclepro.2013.12.034. [COBISS.SI-ID 1998695]

4. ALFIREVIĆ, Marjetka, KRIŽANEC, Boštjan, VONČINA, Ernest, BRODNJAK-VONČINA, Darinka. Presence of nonylphenols in plastic films and their migration into food simulants. *Acta chimica slovenica*, ISSN 1318-0207. [Tiskana izd.], 2011, vol 58, no. 1, str. 127-133. http://acta.chem-soc.si/58/58-1-127.pdf. [COBISS.SI-ID 14880790]

5. KAIŠAREVIĆ, Sonja N., HILSCHEROVA, Klara, WEBER, Roland, SUNDQVIST, Kristina L., TYSKLIND, Mats, VONČINA, Ernest, BOBIC, Stanka, ANDRIĆ, Nebojša, POGRMIC-MAJKIC, Kristina, VOJINOVIĆ-MILORADOV, Mirjana, GIESY, John Paul, KOVAČEVIĆ, Radmila. Characterization of dioxin-like contamination in soil and sediments from the "hot spot" area of petrochemical plant in Pancevo (Serbia). *Environmental science and pollution research international*, ISSN 0944-1344. [Print ed.], 2011, vol. 18, no. 4, str. 677-686, doi: 10.1007/s11356-010-0418-8. [COBISS.SI-ID 15555606]