Univerza v Mariboru

Fakulteta za naravoslovje in matematiko

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	**Nevarne snovi in njihov vpliv na vodne ekosisteme**
Course title:	**Hazardous substances and their impact on aquatic ecosystems**

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.- 4.; 1st-4th
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
15	10		5		150	6

Nosilec predmeta / Lecturer:	Mojca Kos Durjava

Jeziki / Languages:		
	Predavanja / Lectures:	slovenski / Slovene
	Vaje / Tutorial:	slovenski / Slovene

Pogoji za vključitev v delo oz. za opravljanje študijskih obveznosti:	**Prerequisits:**
Poznavanje kemije in ekologije na ravni univerzitetnega programa.	Knowledge of chemistry and ecology at graduate level.

Vsebina:	**Content (Syllabus outline):**
Definicija nevarnih snovi; Porazdelitev in obnašanje nevarnih snovi po vnosu v vodni ekosistem; Testi strupenosti z vodnimi organizmi; Učinek, izpostavljenost in ocena tveganja nevarnih snovi v vodnem ekosistemu. Kemijska zakonodaja REACH in njene zahteve za nevarne snovi. Obravnava nevarnih snovi v okviru Vodne	• Definition of hazardous substances; • Distribution and behaviour of hazardous substances after release in the aquatic ecosystem; • Toxicity testing of aqueous organisms; • Effect, exposure and risk assessment of hazardous substances in aquatic ecosystems; • Chemical legislation REACH and its

direktive. Nevarne snovi v okviru Industrijske emisijske direktive.	demands for hazardous substances; • Hazardous substances under the Water Framework Directive. • Hazardous substances under the IED directive.

Temeljni literatura in viri / Readings:

- Schwedt, G., The Essential Guide to Environmental Chemistry, 2001
- Rand, G. M., Fundamentals of Aquatic Toxicology, 1995
- Thompson, C. K., Wadhia, K., Loibner, A.P., Environmental Toxicity Testing, 2006
- Leeuwen, C.J. van, Vermeire, T.G., Risk Assessment of Chemicals: An Introduction, 2007.

Cilji in kompetence:	**Objectives and competences:**
Študent spozna: • Vrste nevarnih snovi; • Usoda in obnašanje nevarnih snovi v vodnih ekosistemih; • Testiranja strupenosti nevarnih snovi z vodnimi organizmi; • Določanje koncentracije brez učinka za vodne ekosisteme v skladu s kemijsko zakonodajo REACH; • Določanje okoljskih standardov kakovosti v skladu z Vodno direktivo; • Nevarne snovi v okviru direktive IED; • Oceno tveganja za nevarne snovi (kemikalije, aktivne farmacevtske učinkovine, biocidi, pesticidi).	Student learns: • Types of hazardous substances; • Fate and behaviour of hazardous substances in water ecosystems; • Toxicity testing of hazardous substances with aqueous organisms; • Determination of predicted no effect concentration for aquatic ecosystems in line with chemical legislation REACH; • Determination of environmental quality standards in line with Water Framework Directive; • Hazardous substances under the IED directive. • Risk assessment of hazardous substances (chemicals, active pharmaceutical ingredients, biocides, pesticides).

Predvideni študijski rezultati:	**Intended learning outcomes:**

Znanje in razumevanje: Merila za uvrstitev snovi med nevarne snovi. Učinki nevarnih snovi na vodne ekosisteme. Obnašanje nevarnih snovi v vodnih ekosistemih. Vrste vodnih organizmov in načini testiranja strupenosti za vodne organizme. Zakonodaja REACH, Vodna direktiva in Industrijska emisijska direktiva in njihove zahteve za varovanje vodnih ekosistemov pred nevarnimi snovmi. Ocena tveganja za nevarne snovi kot metoda za ugotavljanje dolgoročno problematičnih nevarnih snovi za vodno okolje. **Prenesljive/ključne spretnosti in drugi atributi:** Komuniciranje Kreativno uporabljati pridobljeno znanje pri reševanju konkretnih problemov. Priprava seminarskih nalog in javnega nastopanja.	**Knowledge and understanding:** Criteria for ranking the hazardous substances. Impact if hazardous substances on aquatic ecosystems. Behaviour of hazardous substances in aquatic ecosystems. Types of aqueous organisms and and a way of their toxicity testing. REACH legislation and Water Framework Directive demands for protection of aquatic ecosystem against hazardous substances. Risk assessment of hazardous substances as a method to determine harazdous substances relevant for longterm pollution. **Transferable/Key Skills and other attributes:** Communication Creatively use of knowledge in solving actual problems. Preparing of seminar work and public presentation.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• Predavanja • Seminar • Laboratorijske vaje • Razprave	• Lectures • Seminar work • Laboratory work • Discussions

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Seminarska naloga z zagovorom	50 %	Seminar work and its defence
Pisni izpit	50 %	Written exam

Reference nosilca / Lecturer's references:

- Kos Durjava, M., Kolar, B., Arnuš, L., Papa, E., Kovarich, S., Sahlin, U., Peijnenburg, W. J. G. M., Experimental assessment of the environmental fate and effects of triazoles and benzotriazole. ATLA. Alternatives to laboratory animals, ISSN 0261-1929, 2013, vol. 41, no. 1, str. 65-75. http://altweb.jhsph.edu/pubs/journals/atla/41_1.html. [COBISS.SI-ID 74836993].
- Kos Durjava, M., Kolar, B., Balk, F., Peijnenburg, W. J. G. M., Water framewoork directive and specific pollutants in surface waters in Slovenia. Acta hydrotechnica, ISSN 1581-0267, 2013, letn. 26, št. 45, str. 49-57. [COBISS.SI-ID 81096449].
- Kolar, B., Arnuš, L., Jeretin, B., Gutmaher, A., Drobne, D., Kos Durjava, M., The toxic effect of

oxytetracycline and trimethoprim in the aquatic environment. Chemosphere, ISSN 0045-6535. [Print ed.], 2014, vol. 115, str. 75-80. http://www.sciencedirect.com/science/article/pii/S0045653514002537, doi: 10.1016/j.chemosphere.2014.02.049. [COBISS.SI-ID 3096399].