

UČNI NAČRT PREDMETA / SUBJECT SPECIFICATION

Predmet:	Kinetika okoljskih onesnaževalcev in uporaba testnih organizmov
Subject Title:	

Študijski program Study programme	Letnik Year	Semester Semester
Varstvo okolja in ekotehnologije	2	2 ali 3

Predavanja Lectures	Sem. vaje Tutorial	Lab. vaje Lab. work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
20	15	15		130	6

Nosilec predmeta / Lecturer: doc. dr. Aleksandra Krivograd / Aleksandra Krivograd, Ph.D., Assist. Prof.

Jeziki / SL Predavanja / Lectures: 20
Languages: Vaje / Tutorial: 30

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

Prerequisites:

<p>Pogoj je: osnovno znanje biologije in kemije.</p> <p>Zaželjeno je: opravljen izpit iz kemije okolja in ekosistemskih biologije.</p>	<p>The student is required to have general knowledge of biology and chemistry.</p> <p>It is recommended that the student has already passed the exams of environmental chemistry and biology of ecosystems.</p>
--	---

Vsebina:

Predmet bo obsegal deset tematskih sklopov prilagojenih številu ur, ki so na razpolago.

KINETIKA OKOLJSKIH ONESNAŽEVALCEV IN UPORABA TESTNIH ORGANIZMOV

- uvod, temeljne lastnosti, predstavitev problema študijskega predmeta
- vrste onesnaževalcev
- načini vnosa v okolje in organizme
- dinamika učinkovin
- procesi prenosa, kopičenja in pretvorbe učinkovin
- klasifikacija testnih organizmov za uporabo v eksperimentalne namene
- metode uporabe testnih organizmov
- pomen vzorčevanja
- način identifikacije onesnaževalcev in metode detekcije
- pomen priprave ocene tveganja

Pri predmetu se bo študent seznanil z najpogostejšimi onesnaževalci okolja. Predstavljene skupine bodo smiselno oblikovane in predstavljene glede na pogostnost pojavljanja v okolju, podrobneje bodo izpostavljena zdravila kot onesnaževalci. Znano je, da snovi v okolje vstopajo na različne načine, ravno tako so temu izpostavljeni tudi (ne)ciljni organizmi. Spoznali bomo možne vnose in se podrobno seznanili s procesi, ki so značilni pri vstopu neznanih snovi v organizme. Predvsem je pomemben proces kopičenja oziroma bioakumulacije. Po podrobnejši predstavitvi dinamike procesov, bo sledila predstavitev testnih organizmov, tako vretenčarskih kot nevretenčarskih vrst ter metode njihove uporabe. Nato bo podana razlaga o pomenu vzorčevanja okoljskih vzorcev, načini njihove identifikacije kot različne metode detekcije. Pridobljena metodologija bo služila za poskusno pripravo ocen tveganja (uporaba rezultatov laboratorijskega dela in literaturnih virov) in seznanitev z osnovnimi pojmi s tega področja.

Content (Syllabus outline):

This subject will consist of ten major themes, tailored to the available number of the lecturing hours.

KINETICS OF THE ENVIRONMENTAL CONTAMINANTS AND USE OF TEST ORGANISMS

- introduction and major aims of the subject
- groups of contaminants
- routes of their exposure to the environment and organisms
- dynamics of substances
- processes of transport, bioaccumulation and transformation
- classification of test organisms for experimental purposes
- test methods with experimental organisms
- sampling procedure
- identification of contaminants and methods of their detection
- formation and meaning of risk assessment scheme

This subject will start with the introduction of the most abundant groups of contaminants. Selected groups will be presented according to the frequency of their occurrence in the environment, but with special emphasis on pharmaceuticals as emerging contaminants. Chemical substances enter the environment in different ways, which can affect also the non-target organisms. The students will learn about different entry pathways and also focus on processes of transport, accumulation and transformation. Gained knowledge in the topic of dynamics of substances in the environment will introduce the chapter on experimental organisms – vertebrates and invertebrates, followed by methods of their use. Finally, the importance of environmental sampling will be covered, along with methods of identification and detection of environmental samples. Environmental risk assessment scheme will be formed on the basis of laboratory work results, combined with the data from the literature.

Temeljni literatura in viri / Textbooks:

- Van Leeuwen CJ, Vermeire TG. (2007). Risk Assessment of Chemicals: An Introduction. 2nd ed. Dordrecht: Springer.
- Kümmerer K. (2004). Pharmaceuticals in the Environment: Sources, Fate, Effects and Risks. Berlin: Springer-Verlag.
- Løkke H, Van Gestel CAM. (1998). Handbook of soil invertebrate toxicity tests. 1st ed. Chichester: Wiley and Sons.
- Edwards CA, Bohlen PJ. (1996). Biology and ecology of earthworms. 3rd ed. London: Chapman and Hall.

Cilji:

- Študent se seznanja s najbolj pogostimi onesnaževalci okolja, njihovih vstopnih poteh in vplivu na okolje ter organizme v njem.
- Študent se usposobi za pridobivanje praktičnih izkušenj s področja vzorčenja ter dobi vpogled v pripravo ocene tveganja, enega sestavnih delov okoljske dokumentacije.

Objectives:

- Student acquires general knowledge about the most important groups of environmental pollutants and their effect on the environment and organisms living in it.
- Student gains practical experiences in field sampling. Subject will encourage the acquisition of skills in understanding and preparation of risk assessment schemes.

Predvideni študijski rezultati:

Znanje in razumevanje:

Študent bo ob zaključku tega predmeta sposoben prepoznati osnovne skupine najpogostejših onesnaževalcev, njihove značilne poti vstopnja v okolje in prepoznati različne skupine testnih organizmov. Aktivno študentovo sodelovanje pri predmetu bo omogočilo izkazano razumevanje za predstavljene procese presnove učinkovin in razlago nekaterih preprostejših formul. S pridobljenim znanjem bo možna uporaba primernih detekcijskih metod za zaznavo okoljskih onesnaževalcev in učinkovita analiza priobliženih podatkov. Namen pri predmetu bo tudi nastaviti protokol izpeljave preprostega eksperimenta, organizacijo le-tega in na koncu seveda kritično ovrednotenje celotnega zastavljenega problema. Pričakuje se, da bo študent sposoben pri predmetu pridobiti kritično perspektivo in predvsem znanje glede prepoznave okoljskih onesnaževalcev, možnih komplikacij in tudi rešitev glede njihove nezaželjene pojavnosti v okolju.

Prenesljive/ključne spretnosti in drugi atributi:

Predmet bo omogočil, predvsem preko eksperimentalnega dela (seminarji, laboratorijsko delo, projekti), sposobnost študenta, da bo znal samostojno oblikovati protokol poskusa (identifikacija problema), se seznaniti z metodami, ki se uporabljajo v te namene in potem preko uporabe domače in tuje literature pripraviti poročilo (reševanje problema) – z osnovami ocene tveganja. Za vse to bo potrebno delo v skupini, kjer bo potrebno dobro sodelovanje, zato, da ne bo prišlo do podvajanj posameznih rešitev. Hkrati se bo študent naučil pomena zbiranja (uporaba IKT in drugih didaktičnih pripomočkov) ter interpretiranja podatkov. Predvsem se bo spodbujala komunikacija v smislu aktivnega poročanja,

Intended learning outcomes:

Knowledge and Understanding:

The student will be able to demonstrate general knowledge in groups of contaminants, their entry into the environment and recognize various groups of experimental organisms. Careful following on the subject will enable the student to understand the involved metabolic processes. Furthermore, the student will be able to understand and explain the simpler formulas presented during the course. Student will also be able to decide and select proper methods for various types of environmental sample detection problems and to properly analyze the obtained data. The aim of the subject is also to design a simple experiment, its organization and also a proper evaluation of the results for the given problem. A critical perspective is expected and also recognition of further solutions and ideas regarding emerging pollutants should be gained within the course.

Transferable/Key Skills and other attributes:

This subject will support the ability (especially through seminars, tutorials and lab work) of the student to design an experimental protocol (identification of a problem), familiarize himself with the proper methods for the purpose and then through use of the domestic and foreign literature sources, preparation of the report with some basics of the risk assessment scheme. A good team work will be expected, which will enable careful selection of the data, without any multiplication of the solutions. In this part the student will gain knowledge in use of the didactic supplements and especially in critical interpretation of the data. An active communication will be encouraged by means of oral

s pripravo predstavitev in kritičnim komentiranjem le-teh.

presentations and their critical evaluation through comments.

Metode poučevanja in učenja:

- predavanja
- eno gostujoče predavanje (prof. dr. van Gestel, Vrije University, Nizozemska) (<http://www.falw.vu.nl/nl/onderzoek/ecological-sciences/animal-ecology/staff/kees-van-gestel.asp>)
- seminarji in seminarske vaje
- laboratorijske vaje (odvisno od razpoložljivosti)

Learning and teaching methods:

- lectures
- one lecture of a visiting professor (prof. dr. van Gestel, Vrije University, The Netherlands) (<http://www.falw.vu.nl/nl/onderzoek/ecological-sciences/animal-ecology/staff/kees-van-gestel.asp>)
- seminars and tutorials
- lab work (depends on availability)

Delež (v
%) /

Weight (in
%)

Načini ocenjevanja:

Način (pisni izpit, ustno izpraševanje, naloge, projekt)

- sodelovanje in opravljeni seminarji in seminarske vaje (vključujoč ustno predstavitev) **30**
- opravljene laboratorijske vaje **10**
- kolokvij iz vaj in seminarjev **20**
- pisni izpit **20**
- ustni izpit **30**

Assessment:

Type (examination, oral, coursework, project):

- collaboration and completed seminars and tutorials (including presentation)
- completed lab work
- colloquium of lab work and tutorials
- written examination
- oral examination

Materialni pogoji za izvedbo predmeta :

- predavalnica z multimedijско opremo
- laboratorij z opremo, ki omogoča:
 - postavitev preprostih eksperimentov,
 - nastanitev manjšega števila testnih organizmov (npr. deževnikov),
 - možnost priprave raztopin
 - analizo vzorcev s pomočjo kromatografije (morda možno kot izvedba obiska na specializirani ustanovi-inštitutu)

Material conditions for subject realization:

- classroom with the multimedia equipment
- laboratory with specified laboratory equipment enabling, e.g.:
 - simple experimental designs
 - habitation of standard invertebrate test organisms (earthworms)
 - possibility of solution preparation
 - analysis of samples with chromatographic techniques (also possible through visiting a specialized institution)

Obveznosti študentov:

(pisni, ustni izpit, naloge, projekti)

Od študenta se pričakuje aktivno sodelovanje v smislu priprave seminarjev in seminarjskih vaj, ki so obvezni. Pri tem se ocenjuje predvsem študentova samoociativnost in sposobnost postavljanja kritičnih vprašanj oz. dajanja odgovorov ob predstavitvi lastnega dela. Preprost kolokvij iz seminarjev in laboratorijskih vaj bo tudi predpogoj za pristop k pisnemu delu izpita. Uspešno opravljene zgoraj omenjene aktivnosti zagotovijo pristop še k ustnemu delu izpita.

Student's commitments:

(written, oral examination, coursework, projects):

Student is expected to actively participate at seminars and tutorials, both of which are mandatory. At this point student's self-initiative and ability of critical comments in terms of raising relevant questions and providing answers, while presenting his/hers work, will be assessed. Simple colloquium based on knowledge from tutorials and laboratory work will be the precondition for taking the written exam. Successfully passed aforementioned activities will enable the participation in the final oral exam.