Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS	
Predmet:	Analizna kemija v okolju
Course title:	Environmental Analytical Chemistry

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Ekologija z naravovarstvom		**1.**	Zimski
Ecology with Nature Conservation		**1.**	Autumn

Vrsta predmeta / Course type

Univerzitetna koda predmeta / University course code:

Predavanja Lectures	Seminar Seminar	Sem. vaje Tutorial	Lab. vaje Laboratory work	Teren. vaje Field work	Samost. delo Individ. work	ECTS
30			15	15	120	**6**

Nosilec predmeta / Lecturer: Marjana Simonič

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

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

Potrebno je predhodno osnovno znanje kemije.

Prerequisits:

Basic knowledge of chemistry is needed.

Vsebina:

- Osnovni pojmi o okolju: ponovitev in poglobitev razumevanja lastnosti elementov in spojin v okolju ter reakcij, procesov in različnih ciklov v vseh medijih v okolju.
- Ravnotežja v homogenih in heterogenih sistemih, osnovni principi povezani z analizno kemijo v okolju
- Osnove instrumentalne analizne kemije, pregled elektrokemijskih, spektroskopskih in kromatografskih metod in principov.
- Analizna kemija v okolju: vrste in značilnosti metod, uporabnost pridobljenih

Content (Syllabus outline):

- Basic characteristics of the environment: repetition and deepening understanding of characteristics of elements and substances in the environment and reactions, processes and different cycles in media of the environment.
- Equilibrium in homogeneous and heterogeneous systems, basic principles in environmental analytical chemistry
- Instrumental analytical chemistry: basic principles of electrochemical, spectroscopic and chromatographic methods
- Environmental analytical chemistry: types

informacij, statistično ovrednotenje analiznih rezultatov in napake v analizni kemiji. • Monitoring okolja: osnovni pojmi, postopki za vzpostavitev monitoringa, vrste monitoringa s primeri. • Sredstva za oceno stanja okolja in zakonodaja na področju okolja. • Terenske vaje vzorčenja in Laboratorijske vaje – analize vode, zraka, prsti in sedimenta.	and characteristics of methods, applicability of information, statistical evaluation and errors of analytical results. • Environmental monitoring: basic characteristics, procedures for the development of monitoring, types of monitoring with examples. • Means for estimation of the condition of the environment and legislation. • Field work sampling and Laboratory analysis of water, air, soil and sediment.

Temeljni literatura in viri / Readings:

- D.A. Skoog, F.J.Holler, S. R. Crouch, Principles of Instrumental Analysis, (Poglavja: Gravimetric methods of analyses, Titrimetric methods of analyses, Application of neutralization analyses, Application of Oxidation/Reduction analyses, An introduction to spectroscopic Methods, Atomic spectroscopy) 6.izdaja, Thomson Books/Cole,2007
- J.F. Artiola, I.L. Pepper, M. Brusseau, Environmental monitoring and characterization, Elsevier, 2004,
- M. Kolar, Laboratorijske vaje iz Analizne kemije I, UM FKKT 2003.

Cilji in kompetence:	**Objectives and competences:**
Cilj predmeta je seznaniti študente z osnovnimi pristopi in postopki za • uporabo analizne kemije na področju okolja, • analizo trenutnega stanja okolja, • poznavanje in upoštevanje zakonodaje na področju okolja.	The aim of the subject Environmental Analytical Chemistry: • application of analytical chemistry in the environment, • analysis of the current condition of the environment, • legislation in the field of environment.

Predvideni študijski rezultati:	**Intended learning outcomes:**
Znanje in razumevanje: • pomen in uporabnost analiznih metod za monitoring okolja, • prepoznavanje posameznih toksičnih ali potencialno nevarnih spojin v okolju, • pomen pravilnega vzorčenja in izbira ustrezne analizne metodologije, • ocena stanja okolja, emisijski faktorji in poznavanje zakonodaje na področju okolja. Prenesljive/ključne spretnosti in drugi atributi: Predmet se navezuje in dopolnjuje z ostalimi segmenti v okolju, kot so onesnaževanje okolja, postopki za prikazovanje procesov v okolju, ocenjevanje vplivov na okolje. Ročne spretnosti, predvsem zmožnost praktičnega dela na izbranih analiznih instrumentih. Vzorčenje različnih okoljskih vzorcev, kritično ovrednotenje analiznih rezultatov in pravilna izbira analiznih metod.	Knowledge and Understanding: • importance and applicability of analytical methods for environmental monitoring, • recognition of toxic/potential toxic compounds in environment, • defined sampling procedures for environmental samples and critical selection of analytical methodology, • estimation of the condition of the environment, emission factors, legislation in the field of environment. Transferable/Key Skills and other attributes: The subject is related and complemented with other segments in the environment, such as pollution of the environment, procedures for modelling of environmental processes, environmental impact assessments. Manual skills, preferable the capability of practical work with selected analytical instruments. Sampling

	of different environmental samples and critical evaluation of analytical results.

Metode poučevanja in učenja:	**Learning and teaching methods:**
• predavanja, • učilnica, opremljena z osnovnimi avdio-vizualnimi pripomočki, • ~~terensko delo,~~ vzorčenje, • laboratorijske vaje.	• lectures, • lecture room, equipped with basic audio-visual equipment, • sampling ~~– field work~~, • lab work.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	**Assessment:**
Način (pisni izpit, ustno izpraševanje, naloge, projekt): Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Type (examination, oral, coursework, project): Student passes the examination if s(he) successfully passed all the following obligations:
• pisni izpit vaj – pregled znanja laboratorijskega in terenskega dela,	**30**	• written examination of lab work and in filed work,
• pisni izpit.	**70**	• written examination.

Reference nosilca / Lecturer's references:

PETROVIČ, Aleksandra, SIMONIČ, Marjana. Effect of Chlorella sorokiniana on the biological denitrification of drinking water. *Environmental science and pollution research international*, ISSN 0944-1344. [Print ed.], 2015, vol. 22, issue 7, str. 5171-5183, doi: 10.1007/s11356-014-3745-3. [COBISS.SI-ID 18204694]

PETROVIČ, Aleksandra, SIMONIČ, Marjana. The effect of carbon source on nitrate and ammonium removal from drinking water by immobilised Chlorella sorokiniana. *International journal of environmental science and technology*, ISSN 1735-1472, 15. jan. 2015, vol. , issue , str. 1-14, doi: 10.1007/s13762-014-0747-0. [COBISS.SI-ID 18378518]

TEPUŠ, Brigita, SIMONIČ, Marjana. Uncertainty of the result of TOC determination in water samples. *Accreditation and quality assurance*, ISSN 0949-1775, Jul. 2007, vol. 12, no. 7, str. 357-364. http://dx.doi.org/10.1007/s00769-007-0261-x. [COBISS.SI-ID 11164438]