



Univerza v Mariboru



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Fakulteta za naravoslovje in  
matematiko

### UČNI NAČRT PREDMETA / COURSE SYLLABUS

<b>Predmet:</b>	Analizna kemija v okolju
<b>Course title:</b>	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:**

<b>Jeziki / Languages:</b>	<b>Predavanja / Lectures:</b>	<input type="text" value="slovenski / Slovene"/>
	<b>Vaje / Tutorial:</b>	<input type="text" value="slovenski / Slovene"/>

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

**Prerequisites:**

**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 v analizi kemiji (nevtralizacije, oksidacije-redukcije, obarjanje, kompleksacija itd.).

**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

- Osnove instrumentalne analize kemije, pregled elektrokemijskih, spektroskopskih in kromatografskih metod in principov.
- Analizna kemija v okolju: vrste in značilnosti metod, uporabnost pridobljenih informacij, statistično ovrednotenje analiznih rezultatov in napake v analizi kemiji.
- Monitoring okolja: osnovni pojmi, postopki za vzpostavitev monitoringa, kemijski monitoring, biomonitoring, vrste monitoringa s primeri.
- Sredstva za oceno stanja okolja: emisijski faktorji, zakonodaja na področju okolja.
- Terenske vaje vzorčenja in laboratorijske vaje – analize vode, zraka, prsti in sedimenta.

analytical chemistry (neutralization, oxidation-reduction, precipitation and formation of complexes etc.).

- Instrumental analytical chemistry: basic principles of electrochemical, spectroscopic and chromatographic methods
- Environmental analytical chemistry: types and characteristics of methods, applicability of information, statistical evaluation and errors of analytical results.
- Environmental monitoring: basic characteristics, procedures for the development of monitoring, chemical monitoring, bio-monitoring, types of monitoring with examples.
- Means for estimation of the condition of the environment: emission factors, legislation.
- Field work sampling and laboratory analysis of air, soil and sediment.

### Temeljna literatura in viri / Readings:

D.A. Skoog, D.M. West, F.J. Holler, Fundamentals of Analytical Chemistry, Saunders College Publishing, 7. izdaja, N.Y.1996,

D.A. Skoog, F.J.Holler, T. A. Nieman, Principles of Instrumental Analysis, Saunders College Publishing, 5. izdaja, New York 1998,

J.F. Artiola, I.L. Pepper, M. Brusseau, Environmental monitoring and characterization, Elsevier, 2004,

G.B. Wiersma, Environmental Monitoring, CRC Press, 2004,

E.K. Berner, R.A. Berner, Global environment: water, air and geochemical cycles. Prentice Hall, 1995,

M. Kolar, Laboratorijske vaje iz Analizne kemije I, UM FKKT 2003.

### Cilji in kompetence:

Cilj predmeta je seznaniti študente z osnovnimi pristopi in postopki za

- uporabo analize kemije na področju okolja,
- analizo trenutnega stanja okolja,
- poznavanje in upoštevanje zakonodaje na področju okolja.

### Objectives and competences:

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:

Znanje in razumevanje:

- pomen in uporabnost analiznih metod za monitoring okolja,
- prepoznavanje posameznih toksičnih ali potencialno nevarnih spojin v okolju,

### Intended learning outcomes:

Knowledge and Understanding:

- importance and applicability of analytical methods for environmental monitoring,
- recognition of toxic/potential toxic compounds in environment,

- 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.

- 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:

- predavanja,
- učilnica, opremljena z osnovnimi avdio-vizualnimi pripomočki,
- terensko delo, vzorčenje,
- laboratorijske vaje.

#### Learning and teaching methods:

- lectures,
- lecture room, equipped with basic audio-visual equipment,
- sampling – field work,
- lab work.

Delež (v %) /

Weight (in %)

#### Načini ocenjevanja:

#### Assessment:

Način (pisni izpit, ustno izpraševanje, naloge, projekt):	Delež (v %) / Weight (in %)	Type (examination, oral, coursework, project):
Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:		Student passes the examination if s(he) successfully passed all the following obligations:
<ul style="list-style-type: none"> <li>• pisni izpit vaj – pregled znanja laboratorijskega in terenskega dela,</li> </ul>	40	<ul style="list-style-type: none"> <li>• written examination of lab work and in filed work,</li> </ul>
<ul style="list-style-type: none"> <li>• pisni izpit.</li> </ul>	60	<ul style="list-style-type: none"> <li>• written examination.</li> </ul>

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

1. PULKO, Irena, KOLAR, Mitja, KRAJNC, Peter. Atrazine removal by covalent bonding to piperazine functionalized PolyHIPEs. *Sci. total environ.*, Nov. 2007, vol. 386, iss. 1/3, str. 114-123. <http://dx.doi.org/10.1016/j.scitotenv.2007.06.032>. [COBISS.SI-ID 11508246].

2. KRAJNC, Bojana, KOLAR, Mitja. Chemical analysis and the river Mura water quality. *International journal of sanitary engineering research*, Feb. 2010, vol. 4, no. 2, str. 4-17. [COBISS.SI-ID 15255574].

3. BRGLEZ, Polonca, HOLOBAR, Andrej, PIVEC, Aleksandra, BELŠAK, Nataša, KOLAR, Mitja. Determination of oxygen by means of a biogas and gas - interference study using an optical tris (4,7-

diphenyl-1,10-phenanthroline) ruthenium(II) dichloride complex sensor. *Acta chim. slov.*. [Tiskana izd.], 2012, vol. 59, no. 1, str. 50-58, graf. prikazi. <http://acta.chem-soc.si/59/59-1-50.pdf>. [COBISS.SI-ID 15889686].