



Univerza v Mariboru

Fakulteta za kemijo
in kemijsko tehnologijo

UČNI NAČRT PREDMETA / COURSE SYLLABUS

Predmet:	Analizna kemija II
Course title:	Analytical Chemistry II

Študijski program in stopnja Study programme and level	Študijska smer Study field	Letnik Academic year	Semester Semester
Enovit magistrski študijski program druge stopnje Predmetni učitelj		2.	zimski
Five-year master's degree program Subject Teacher		2.	Autumn

Vrsta predmeta / Course type

Obvezni / Obligatory

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
45			30		105	6

Nosilec predmeta / Lecturer:

Matjaž Finšgar

Jeziki /

Predavanja / Lectures: Slovenski / Slovene

Languages:

Vaje / Tutorial: Slovenski / Slovene

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

Osnovno znanje klasične analize kemije, matematike in fizike

Prerequisites:

Basic knowledge of classical analytical chemistry, mathematics and physics

Vsebina:

Predavanja

-Statistično ovrednotenje analiznih rezultatov, napake v analizi kemiji, natančnost, točnost, merilna negotovost

-Elektrokemijske metode

Potenciometrija (ionoselektivne elektrode)

- elektrode s stekleno membrano, elektrode s kristalinično homogeno in heterogeno membrano, elektrode s tekočinsko membrano,

Voltometrija

Content (Syllabus outline):

Lectures

-Statistical evaluation of analytical results, errors in analytical chemistry, precision, accuracy, measurement uncertainty

-Electrochemical methods

Potentiometry, ion-selective electrodes, glass electrodes, solid state crystalline homogeneous and heterogeneous membrane electrodes, liquid membrane electrodes

Voltammetry

- direktna in pulzna polarografija, stripping analiza, ciklična voltometrija, amperometrične titracije
 Konduktometrija
 Elektrogravimetrija in kulometrija
 - elektroliza pri konstantni napetosti in pri konstantnem toku, elektroliza pri kontroliranem potencialu, potenciostatična kulometrija, kulometrične titracije
 - Spektroskopske metode
 Atomska absorpcijska spektrometrija, atomska emisijska spektrometrija, molekulska spektrometrija ICP spektrometrija, masna spektrometrija
Separacijske metode
 Ekstrakcijske metode, ekstrakcija na trdni fazi Tankoplastna kromatografija, plinska kromatografija, tekočinska kromatografija, ionska kromatografija, sklopljene tehnike z masno spektrometrijo
Laboratorijske vaje
 Vaje zajemajo praktične primere izvedbe analiznih postopkov na področjih elektrokemijskih, spektroskopskih in separacijskih metod

Direct and pulse polarography, stripping analysis, cyclic voltammetry, amperometric titrations
 Conductometry
 Electrogravimetry and coulometry
 Constant cathode potential gravimetry, constant current gravimetry, potentiostatic coulometry, coulometric titrations
-Spectroscopic methods
 Atomic absorption spectroscopy, atomic emission spectroscopy, molecular absorption spectroscopy, ICP spectroscopy, mass spectrometry
-Separation methods
 Extraction methods, solid phase extraction, planar chromatography, gas liquid chromatography, high performance liquid chromatography, ion chromatography, hyphenated techniques with mass spectrometry

Laboratory work
 Practical examples of analytical procedures in electrometric, spectrometric and separation methods

Temeljni literatura in viri / Readings:

Poglavja Part IV, V, VI v D. A. Skoog, D. M. West, F. J. Holler, S. R. Crouch, Fundamentals of Analytical Chemistry, 9. izdaja, Brooks/Cole, 2014

ki se dopolnjujejo s sorodnimi poglavji v:

- D. A. Skoog, F. J. Holler, S. R. Crouch, Principles of Instrumental Analysis, 6. izdaja, Thomson Brooks/Cole, 2007

Cilji in kompetence:

Predmet daje poglobljeno znanje teoretskih osnov in aplikacij analiznih metod elektrokemijske analize, spektroskopske analize in separacijskih metod. Podatki o sestavi materialov vodijo vsak proizvodni proces v raznih fazah od surovin do končnih produktov. Analiza je osnova za vrednotenje hrane, okolja, delovanja organizmov. Predmet analzna kemija 2 obravnava zato področje kemijske analize teoretično poglobljeno, praktično pa tako usmerjeno, da usposobi slušatelje ne samo za razumevanje, temveč tudi za reševanje analiznih problemov. Predmet daje integralni pregled teorij in metod uporabnih za identifikacijo in rešitev vrste realnih problemov kemijske analize. Primeri iz področij anorganske kemije, organske kemije in biokemije se uporabljajo za razumevanje kemijskih in fizikalnih procesov, ki spremljajo analizni postopek.

Objectives and competences:

Subject gives the complete overview of knowledge concerning the theoretical basis and applications of analytical methods in electrochemical, spectroscopic and separation methods. Data from the content of materials lead every production process in different phases from raw materials to final products. Analysis is the basis for quality evaluation of food, environment and living organisms. The analytical chemistry gives the complete theoretical overview and during practical work gives the knowledge not only for understanding but also for solving analytical problems. The subject gives the integral overview of theories and methods used for identification and quantitative determination of real problems of chemical analysis. Examples from inorganic chemistry, organic chemistry and biochemistry are used for

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understanding of chemical and physical processes which accompany analytical procedure.

Predvideni študijski rezultati:

Znanje in razumevanje:

- Po zaključku tega predmeta bo študent sposoben
- razumeti osnove kemijske analize, osnovnih instrumentalnih analiznih meritev.
 - spoznati osnovne principe in zakone na katerih temeljijo instrumentalne analize metode
 - spoznati kvantitativno ovrednotenje rezultatov meritev

Prenesljive/ključne spretnosti in drugi atributi:

Ročne spretnosti, predvsem zmožnost praktičnega dela na instrumentih. Ovrednotenje rezultatov meritev in merilne negotovosti.

Intended learning outcomes:

Knowledge and Understanding:

- On completion of this course the student will be able to
- understand the base of chemical analysis and basic instrumental analytical measurements
 - recognize basic principles and laws on which instrumental analytical methods are based.
 - recognize quantitative evaluation of measurements results.

Transferable/Key Skills and other attributes:

Manual skills, preferable the capability of practical work with instruments. Evaluation of analytical results and measurement uncertainty.

Metode poučevanja in učenja:

- Predavanja
- Laboratorijske vaje

Learning and teaching methods:

- Lectures
- Lab work

Delež (v %) /

Weight (in %)

Načini ocenjevanja:

Assessment:

<p>Pristopni pogoji za opravljanje vaj: opravljene vaje iz Analizne kemije I in zaključni kolokvij</p> <p><u>Pristopni pogoji za opravljanje izpita:</u></p> <ul style="list-style-type: none"> • Opravljene lab. vaje in test iz vaj Analizna kemija II. <p>Izpit je opravljen, če so pozitivno opravljene vse naslednje obveznosti:</p> <p><u>Ocenjevanje predmeta</u></p> <ul style="list-style-type: none"> • Pisni izpit ali trije delni pisni izpiti <p><u>Ocenjevanje lab. vaj</u></p> <ul style="list-style-type: none"> • Pisni test po zaključenih laboratorijskih vajah 	<p>70</p> <p>30</p>	<p><u>Conditions to access the laboratory work:</u> Concluded lab work of Analytical chemistry I and final written test</p> <p><u>Conditions to access the examination:</u></p> <ul style="list-style-type: none"> • Concluded lab. work and written test of lab. work in Analytical Chemistry II. <p>Student passes the examination if s(he) successfully passed all the following obligations:</p> <p><u>Assessment of the subject</u></p> <ul style="list-style-type: none"> • Course work, analytical calculations • Written examination or two mid-term written exams <p><u>Assessment of lab work</u></p> <ul style="list-style-type: none"> • Written test after conclusion of lab work
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Reference nosilca / Lecturer's references:

FINŠGAR, Matjaž. The first X-ray photoelectron spectroscopy surface analysis of 4-methyl-2-phenyl-imidazole adsorbed on copper. Analytical methods, ISSN 1759-9660, 2015, vol. 7, iss. 16, str. 6496-6503, doi: 10.1039/C5AY00896D. [COBISS.SI-ID 18754582]

FINŠGAR, Matjaž, JACKSON, Jennifer. Electrochemical study of AISI C1018 steel in methanesulfonic acid containing an acetylenic alcohol-based corrosion inhibitor formulation. Journal of laboratory automation,

ISSN 2211-0690. [Online ed.], Article first published online: July 9, 2015, vol. , no. , str. 1-10, doi: 10.1177/2211068215593376. [COBISS.SI-ID 18831638]

FINŠGAR, Matjaž, JACKSON, Jennifer. The corrosion resistance of 2205 duplex steel in non-inhibited methanesulphonic acid at elevated temperature. *Materials and corrosion*, ISSN 0947-5117, Nov. 2015, vol. 66, iss. 11, str. 1299-1304, doi: 10.1002/maco.201408222. [COBISS.SI-ID 18635286]