

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
UŠP Kemija, 1. stopnja	/	2.	3.
USP Chemistry, 1 st Cycle	/	2 nd	3 rd

Vrsta predmeta / Course Type:

obvezni / Mandatory

Univerzitetna koda predmeta / University Course Code:

KE112

Predavanja Lectures	Seminar Seminar	Vaje Tutorial	Klinične vaje Work	Druge oblike študija	Samost. delo Individual Work	ECTS
40	35	/	/	/	75	5

Nosilec predmeta / Lecturer:

prof. dr. Helena Prosen / Dr. Helena Prosen, Full Professor

Jeziki / Languages:

Predavanja / Lectures: slovenski / Slovenian

Vaje / Tutorial: /

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

Študent oz. kandidat mora imeti predmet opredeljen kot študijsko obveznost.

Prerequisites:

The course has to be assigned to the student.

Vsebina:

Statistika in vrednotenje analiznih rezultatov: naključne in sistematične napake, statistični parametri in obdelava podatkov, širjenje negotovosti, zagotavljanje kakovosti v analizni praksi.

Instrumentalne analize tehnike – razdelitev in značilnosti

Osnovne elektrokemijske zakonitosti: napetost člana in odvisnost od koncentracije, redoks titracije.

Potenciometrija: principi, indikatorske in referenčne elektrode, steklena elektroda in ISE, viri napak, potenciometrična indikacija pri različnih vrstah titracij.

Voltametrične tehnike: tokovno-napetostna zveza, polarizacija. Elektrogravimetrija in

Content (Syllabus outline):

Statistics and evaluation of analytical results: random, systematic error, statistical parameters and data processing, propagation of uncertainty, quality assurance in analysis.

Instrumental analytical techniques - types and properties

Basic electrochemical concepts: cell potential, its relation to concentration, redox titration.

Potentiometry: principles, indicator and reference electrodes, glass electrode, ISE, source of errors, potentiometric indication in titrimetry.

Voltammetry: current-voltage relationship, polarization. Electrogravimetry and coulometry: principles, source of errors, typical applications.

Basic spectroscopic techniques and types of

kulometrija: principi, viri napak, značilne aplikacije.

Osnovne spektroskopske tehnike in pregled metod:

Interakcija elektromagnetnega valovanja s snovjo, principi tehnik in uporabnost v analizi kemiji.

Molekulska absorpcijska spektrometrija in fluorescenca: osnovne zakonitosti in značilnosti tehnik (merilni obseg, selektivnost, interference) in aplikacije.

Plamenska fotometrija in emisijska spektrometrija: osnovni principi, aparatura, karakteristike metod (merilni obseg, selektivnost, interference), značilne aplikacije v analitiki anorganskih sestavin.

Osnove separacij v analizi kemiji:

Principi in teorija separacijskih tehnik, kromatografski parametri. Tankoplastna kromatografija, osnove kolonske analize kromatografije. Osnove elektroforeze. Ekstrakcija tekoče-tekoče, porazdelitveni koeficient.

Osnovni pojmi in principi odvzema in priprave vzorcev.

methods:

Interaction of electromagnetic radiation with matter, principles of techniques, applicability in analytical chemistry.

Molecular absorption spectrometry and fluorescence: basic concepts and properties (measurement range, selectivity, interferences), applications.

Flame photometry and emission spectrometry: basic principles, instrument, method characteristics (measurement range, selectivity, interferences), typical applications in inorganic analysis.

Basic separation techniques in analytical chemistry:

Principles and theory of separation techniques, chromatographic parameters. Thin-layer chromatography, basics of column analytical chromatography. Basics of electrophoresis. Liquid-liquid extraction and partition coefficient.

Basic concepts and principles of sampling and sample preparation.

Temeljna literatura in viri / Readings:

Temeljna:

B. Pihlar, H. Prosen, Osnove analize kemije, Založba UL KKT, Ljubljana 2019, 230 str.

Dodatna:

1. D. A. Skoog, D. M. West, F. J. Holler, S.R. Crouch, Fundamentals of Analytical Chemistry, 8th Ed., Thomson Brooks/Cole, London, 2004, poglavja 5-9, 18-28;

2. D. C. Harris, Quantitative Chemical Analysis, 5th ed., Freeman, New York, 1999.

3. Analytical Chemistry A Modern Approach to Analytical Science, Ed. by R. J.- Mermet, M. Otto, M. Valcarcel, Founding Editors: R. Kellner, H.M. Widmer, Wiley - VCH, Weinheim, 2004.

Cilji in kompetence:

Cilji: Služatelji pridobijo v okviru predmeta znanja, potrebna za izvedbo nekaterih osnovnih instrumentalnih analiznih tehnik.

Kompetence: Usposobijo se za eksperimentalno delo in spoznajo pristope za izvedbo kompleksnih analiz, načine vrednotenja merskih rezultatov ter reševanja analiznih nalog in problemov v praksi.

Objectives and Competences:

Objectives: Students gain the knowledge necessary to perform certain basic instrumental analytical techniques.

Competences: Gaining ability for experimental work, learning approaches to perform complex analyses, evaluation of results and practical solving of analytical problems and tasks.

Predvideni študijski rezultati:

Intended Learning Outcomes:

<p><u>Znanje in razumevanje</u> Študent osvoji osnovne principe statistične obravnave rezultatov, kot so natančnost in pravilnost, meja zaznave in občutljivost, merilna negotovost. Zna izbrati analizo metodo in rezultate kritično ovrednotiti. Obvlada posamezne instrumentalne analize tehnike, pozna njihove pomembnejše karakteristike in omejitve ter značilne aplikacije.</p>	<p><u>Knowledge and Comprehension</u> <u>Knowledge and comprehension</u> Student learns the basic principles of statistical evaluation of results, i.e. precision, accuracy, limit of detection, sensitivity, measurement uncertainty. Is able to select an analytical method and critically evaluate the results. Masters certain instrumental analytical techniques, knows their principal characteristics, limitations and typical applications.</p>
<p><u>Uporaba</u> Študent se usposobi za samostojno delo v analinem laboratoriju in pridobi temeljna znanja, potrebna za razumevanje snovi pri višjih kurzih (Instrumentalna analiza) in raziskovalnem delu.</p>	<p><u>Application</u> Student qualifies for autonomous work in the analytical lab; gains fundamental knowledge to understand the subject matter of succeeding courses (Instrumental Analysis) and research work.</p>
<p><u>Refleksija</u> Nauči se kritičnega pristopa do informacij in obravnave eksperimentalnih rezultatov.</p>	<p><u>Analysis</u> Learns to critically evaluate the information and experimental results.</p>
<p><u>Prenosljive spretnosti</u> Osvoji pristope k reševanju analiznih problemov, zna uporabiti teoretične principe v praksi, izvesti analizo po standardnih postopkih in navedbah v literaturi, obvlada obdelovanje podatkov in njihovo predstavitev.</p>	<p><u>Skill-transference Ability</u> Masters the approaches to solve analytical problems; can use theoretical principles in the praxis; can perform analysis by standard procedures and methods from the literature; masters data processing and their presentation.</p>

Metode poučevanja in učenja:

- a) Predavanja z demonstracijskimi eksperimenti,
b) seminarji usmerjeni v poglobljanje in razumevanje teorije in reševanje praktičnih primerov

Learning and Teaching Methods:

- a) Lectures with practical demonstrations
b) seminars to enhance the understanding of theoretical principles and to solve practical examples.

Načini ocenjevanja:	Delež (v %) / Weight (in %)	Assessment:
Pisni izpit	50 %	Written exam
Ustni izpit	50 %	Oral exam

Reference nosilca / Lecturer's references:

- A. Ćirić, H. Prosen, M. Jelikić Stankov, P. Đurđević. Evaluation of matrix effect in determination of some bioflavonoids in food samples by LC-MS/MS method. *Talanta* 2012, 99, 780-790.
- H. Prosen, M. Kokalj, D. Janeš, S. Kreft. Comparison of isolation methods for the determination of buckwheat volatile compounds. *Food Chem.* 2010, 121, 298-306.
- I. Kralj Cigić, H. Prosen. An overview of conventional and emerging analytical methods for the

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