

Course description

Course abbreviation:	KALCH/C001A	Page:	1 / 2
Course name:	Analytical Chemistry I		
Academic Year:	2023/2024	Printed:	28.05.2024 04:39

Department/Unit /	KALCH / C001A			Academic Year	2023/2024
Title	Analytical Chemistry I			Type of completion	Examination
Accredited/Credits	Yes, 5 Cred.			Type of completion	Combined
Number of hours	Lecture 3 [HRS/WEEK]				
Occ/max	Status A	Status B	Status C	Course credit prior to	NO
Summer semester	0 / -	0 / -	0 / -	Counted into average	YES
Winter semester	0 / -	0 / -	3 / -	Min. (B+C) students	not determined
Timetable	Yes			Repeated registration	NO
Language of instruction	English			Semester taught	Winter semester
Optional course	Yes			Internship duration	0
Evaluation scale	A B C D E F				
No. of hours of on-premise					
Auto acc. of credit	No				
Periodicity	K				
Substituted course	None				
Preclusive courses	N/A				
Prerequisite courses	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

Introducing students to the elements of classical chemical analysis, namely: (i) basic concepts and definitions, qualitative vs. quantitative analysis, basic laboratory operations; (ii) reactions and identification of selected inorganic cations and anions; (iii) gravimetric analysis: principles, laboratory equipment and selected methods, (iv) volumetric analysis: principles, laboratory equipment and selected methods; (v) basic calculations and recalculations: concentration vs. content, calculating stoichiometry, pH for solutions of acids, bases, and salts.

Requirements on student

The subject builds upon secondary-school knowledge of general, inorganic, and organic chemistry (acquired in the country of origin); written test - 70% of exam, oral examination - 30% of exam

Content

Classical Chemical Analysis (ANA-I)

- Basic definition and principles Fundamental laws and formulas, qualitative vs. quantitative analysis.
- Chemical Reactions Types and variants: Neutralisation, precipitation of sparingly soluble and insoluble salts, complexation and chelating, reactions releasing gases, markedly coloured soluble products and precipitates.
- Qualitative analysis ... Definition and principles; Identification of inorganic ions: (i) selected cations: Ag⁺, Pb²⁺, Cu²⁺, Fe²⁺/3⁺, Co²⁺, Ni²⁺, Cr³⁺, Ca²⁺, Na⁺, K⁺, and NH₄⁺; (ii) selected anions: Cl⁻, I⁻, SO₄²⁻, SO₃²⁻, HPO₄²⁻, CO₃²⁻, CrO₄²⁻, MnO₄⁻, NO₂⁻, NO₃⁻.
- Quantitative Analysis / Gravimetry (Precise weighing) Definition and basic principles, laboratory operations to obtain, isolate, and manipulate the precipitates, weighing procedure(s). Selected methods of gravimetric determinations: silver as AgCl, iron as Fe₂O₃, and nickel as Ni(DMG)₂.
- Quantitative Analysis / Volumetry (Titrations) Definition: Basic principles, way of indication, standardised solutions, titration curves and equivalence point(s). (i) Acid-base (protolytic) titrations: Main principles with chemical equations, indicators and their colour changes, types of titration curves (according to the titrant); (ii) Precipitation titrations: Main chemical equations, indicators and their colour and/or phase changes, typical titration curve, selected example(s) from analytical practice. (iii) Complex-forming

titrations: Main chemical equations, indicators and their colour changes, typical titration curve, selected example(s). (iv) Redox titrations: Main chemical equations, indicators and their colour changes, typical titration curve, selected examples.

- Basic Calculations in Chemical Analysis Concentration and the content: definition, molar concentration, mass concentration, percentage, recalculations; Calculations of pH: strong and weak acids and/or bases, mixtures of two acids, salts from acids and bases.

Prerequisites - other information about course preconditions

The subject requires the basic knowledge and skills on general, inorganic and organic chemistry, as well as working with chemical literature. Obvious is good knowledge of English language, both written and spoken.

Competences acquired

Graduates of the course will gain a basic overview on classical chemical analysis and its key topics, will also practice working with chemical literature and improve their scientific English.

Fields of study

Guarantors and lecturers

- **Guarantors:** prof. Ing. Ivan Švancara, Dr. (100%)

Literature

- **Recommended:** Gary, D. Christian. *Analytical Chemistry*, 1994, New York, John Wiley & Sons.
- **Recommended:** Skoog D.A. Fundamentals of Analytical Chemistry, 9th Ed. New York. 2013.
- **Recommended:** Svehla Gy, Ed. Textbook of Qualitative Inorganic Analysis. London. 1979.
- **Recommended:** Jeffery G.H. et al. Textbook of Quantitative Chemical Analysis. London. 1989.

Teaching methods

Monologic (reading, lecture, briefing)

Assessment methods

Oral examination
Written examination

Course is included in study programmes: