COURSE DESCRIPTION CARD - SYLLABUS

Course name
Analytical chemistry [S1TOZ1>CA]

Course

Field of study
Circular System Technologies

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
45

Other (e.g. online)
0

Tutorials
0

Projects/seminars
0

Number of credit points

6,00

Coordinators

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Lecturers

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Prerequisites

Student has the basic knowledge of inorganic chemistry, apparatus and glassware used in the chemical laboratory as well as mathematical tools used in the chemical calculations.

Course objective

To familiarize students with methods of quantitative analysis (volumetric, precipitation and gravimetric) commonly used in analytical chemistry. Learning the proper way of conducting the determinations carried out in the laboratory (methodology, preparation of standard solutions, titration, weighing, precipitation and filtration, washing and drying of precipitant). Gaining proficiency in analytical calculations which will allow student to perform chemical analyses and necessary calculations in the future.

Course-related learning outcomes

Knowledge:
1. student has the systematic, theoretically founded general knowledge in the field of analytical chemistry [k_w04].
2. student knows techniques, methods of identification and characterization of main and by-products in circular system technologies [k_w11].
3. student knows the techniques and methods of monitoring of typical chemical environmental pollutants [k_w09].

Skills:
1. the student is able to obtain the necessary information from the literature and other sources related to circular system technologies to conduct the determination of an analyte in a sample [k_u01].
2. student is able to plan and perform simple experiments related to circular system technologies, using both experimental and simulation methods, and can interpret their results and draw conclusions [k_u21].
3. student has the ability to self-study, is able to use source information in polish and a foreign language in accordance with the principles of ethics, reads with understanding, conducts analyses, syntheses, summaries, critical assessments and formulates correct conclusions [k_u04].
4. student selects analytical methods suitable for qualitative and quantitative determination of chemical compounds [k_u13].

Social competences:
1. student can take care and shows full responsibility for the equipment used in the chemical laboratory [k_k07].
2. student independently makes and implements the plan of tasks entrusted to him, defining the priorities for its implementation, critically assesses the level of advancement in the implementation of the assigned tasks [k_k03].
3. student objectively evaluates the level of her/his knowledge and skills, understands the importance of improving professional and personal competencies adequately to the changing social conditions and the scientific progress [k_k05].

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

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Knowledge acquired during the lectures is verified during the written exam containing 10-15 questions. Passing threshold: 55% of points. Exam will be held in a stationary or remote form on Ekursy platform.
During the laboratory course, Student"s knowledge is verified during four tests. Tests will be held in a stationary or remote form on Ekursy platform. Passing threshold: 55% of points.
Student also has to make the written reports of the performed experiments.

Programme content

Theoretical and practical aspects of analytical chemistry: ionic activity and ionic strength in solutions, strong and weak electrolytes; balance in the acid-base reactions, oxidation-reduction reactions/titrations, complexes and complex formation titrations, precipitate-formation titrations, volumetric analysis techniques (titration curves, indicators, analytical calculations).
1. The assessment of risks occurring during the laboratory work.
2. Tha volumetric analysis:
a) ACID-BASE TITRATION
- determination of the total acidity and alkalinity of the solution,
- determination of carbonates and bicarbonates by the Warder method,
- determination of ammonia,
b) OXIDATION-REDUCTION TITRATIONS
- determination of calcium ions,
- determination of dissolved oxygen by the Winkler method,
- determination of phenol,
c) COMPLEXOMETRIC TITRATION
- determination of iron,
- determination of calcium and magnesium ions (water hardness),
d) PRECIPITATE TITRATION

- determination of chloride using the Mohr method,
- determination of chloride using the Volhard method.

Teaching methods

1. Lecture: multimedia presentation, discussion.
2. Performing the experiments according to the appropriate analytical procedures and the instructions of the supervisor.

Bibliography

Basic
1. J. Minczewski, Z. Marczenko, Chemia analityczna, t.1 i 2, PWN Warszawa 2007.
2. A. Cygański, Chemiczne metody analizy ilościowej, WNT Warszawa 2019.
3. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej, t.1, WNT Warszawa 2006/2007.
4. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WNT Warszawa 2004.
5. M. Wesołowski, K. Szefer, D. Zimna, Zbiór zadań z chemii analitycznej, WNT Warszawa 2002.
Additional
1. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, PWN, Warszawa 2012.
2. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN, Warszawa 2020.
3. W. Ufnalski, Równowagi jonowe, WNT Warszawa 2004.

Breakdown of average student's workload

	Hours	ECTS
Total workload	151	6,00
Classes requiring direct contact with the teacher	76	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	75	3,00