COURSE DESCRIPTION CARD - SYLLABUS

Course name
Chemia analityczna

Course

Field of study
Technologia chemiczna (Chemical Technology)
Year/Semester
II/3
Area of study (specialization)
-
Profile of study
general academic
Level of study
First-cycle studies
Course offered in
Polish
Form of study
part-time
Requirements
compulsory

Number of hours

Lecture
20
Laboratory classes
50
Other (e.g. online)
0
Tutorials
0
Projects/seminars
0

Number of credit points

6

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:

Prerequisites

Basic knowledge of inorganic chemistry, apparatus used in the chemical laboratory, mathematical tools used in the chemical calculations. Usage of the basic chemical apparatus and volumetric glassware. Understanding of the need to supplement her/his education and increasing personal and professional competences.

Course objective

To familiarize Students with the practical use of conventional (volumetric) techniques and methods used in analytical chemistry. To teach the proper way of conducting (methodology, preparation of standard solutions, titration, weighing, precipitation and filtration, washing, drying) the determinations carried out in the laboratory (acid-base titration, oxidation-reduction titrations, complexometric titration, precipitation, gravimetric techniques) as well as gaining proficiency in analytical calculations. Thus it will boost the Student's confidence in their own skills at performing the analytical procedures.

Course-related learning outcomes

Knowledge

1. Student has the necessary knowledge in the field of chemistry for the understanding of phenomena and processes occurring during the reaction used in analytical chemistry [K_W03, K_W11]

2. Student has the systematic, theoretically founded general knowledge in the field of analytical chemistry [K_W08]

Skills

1. Student can gather the necessary information from the literature to conduct the determination of an analyte in the test sample [K_U01]

2. Student is able to perform basic chemical analysis, interprets the results of analyses and draw appropriate conclusions [K_U01, K_U18, K_U21]

3. Student is able to work both individually and in team during the laboratory work [K_U02]

Social competences

1. Students understand the need for self-studying and improvement of their professional competences [K_K01]

2. Student is aware of the principles of engineering ethics [K_K02, K_K05]

3. Students can cooperate and work in a group, taking different roles [K_K03]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as a part of the lecture is verified during the exam at the end of the semester. The exam covers main branches of analytical chemistry (acid-base reactions, redoximetry, complexometry, precipitation analysis and gravimetric analysis). Passing threshold: 55% of points.

Skills acquired as a part of the laboratory exercises are verified on the basis of four final tests. Each colloquium consists of 5-8 tasks/questions, differently scored depending on their level of difficulty. Passing threshold: 55% of points.

After each completion of the laboratory exercise, Student is required to make a written report.

Programme content

Practical aspects of analytical chemistry: ionic activity and ionic strength in solutions; strong and weak electrolytes; equilibrium in the acid-base reactions, oxidation-reduction reactions, complexes formation reactions, precipitate formation reactions; volumetric-titration techniques (titration curves, indicators,

analytical calculations) and gravimetric analysis techniques:
1. The assessment of risks occurring during the laboratory work

2. Volumetric analysis:

- acid-base titration: preparation of standard solutions, determination of acetic acid, determination of NaOH and Na2CO3 with the use of Warder method,

- oxidation-reduction titration: determination of Ca2+, determination of phenol,

- complexometric titration: determination of Ca2+ and Mg2+ (water hardness), determination of sulfate,

- precipitate titration - determination of chloride with the use of Mohr method, determination of chloride with the use of Volhard method.

3. Gravimetric analysis: iron determination as Fe2O3

Teaching methods

1. Lecture: multimedia presentation, discussion.

2. Laboratory exercises: performing practical exercises (determinations) in accordance with the schedule of the subject and written reports including the appropriate chemical reactions together with mathematical calculations.

Bibliography

Basic

1. J. Minczewski, Z. Marczenko, Chemia analityczna, t.1 i 2, PWN Warszawa 2007/2020

2. A. Cygański, Chemiczne metody analizy ilościowej, WNT Warszawa 2005/2013

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

Additional

1. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, PWN Warszawa 1992/2012

2. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, PWN Warszawa 2013/2020

3. R. Kellner, J.M. Mermet, M. Otto, H.M. Widmer, Analytical Chemistry, Wiley-VCH, Weinheim, 1998

Breakdown of average student's workload

	Hours	ECTS
Total workload	150	6,0
Classes requiring direct contact with the teacher	85	3,4
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) [1]	65	2,6

[1] delete or add other activities as appropriate