COURSE DESCRIPTION CARD - SYLLABUS

Course name
Analytical chemistry [S1IFar2>CA]

Course

Field of study
Pharmaceutical Engineering

Year/Semester
2/3

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
30

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

5,00

Coordinators

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Lecturers

Prerequisites

The student has ordered knowledge in the field of inorganic chemistry, basic knowledge about the properties of chemical compounds and chemical analysis obtained as a part of the program of classes in general and inorganic chemistry. The student should have the knowledge and skills acquired in the subject of mathematics necessary in chemical calculations. The student uses basic chemical equipment and laboratory glassware.

Course objective

To familiarize students with the practical use of typical techniques and methods used in quantitative (volumetric) analysis on the example of selected determinations. Teaching the right course of action (methodology, specificity of laboratory work, preparation of standard solutions, titration, weighing, precipitation and filtration, washing, drying) in the volumetric methods used in the laboratory (alkacimetry, redoximetry, complexometry, precipitation titration, gravimetric analysis), and also acquiring proficiency in analytical calculations, which will shape student confidence in their own skills in performing analyzes.

Course-related learning outcomes

Knowledge:

1. Has ordered, theoretically founded general knowledge in the field of inorganic and analytical chemistry enabling understanding, description and research of chemical phenomena and processes related to pharmaceutical engineering. [K_W4]
2. Has knowledge of the basic techniques, methods for characterizing and identifying pharmaceutical products and research tools used in pharmaceutical engineering, knows the classic methods used in assessing the quality of substances for pharmaceutical purposes and in quantitative analysis in medicinal products together with the criteria for their selection for the intended purpose.[K_W7]

Skills:
1. Selects and applies analytical methods and techniques in qualitative and quantitative analysis as well as to control processes and assess the quality of raw materials and products.[K_U11]
2. Has the ability to self-study.[K_U24]
3. In a professional and research environment can plan and organize individual and team work as well as work both individually and as a team.[K_U25]

Social competences:
1. Is ready to critical assessment of his/her knowledge, understands the need for further education, supplementing specialized knowledge and raising his professional, personal and social competences, understands the importance of knowledge in solving problems and is ready to consult experts.[K_K1]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired as part of the lecture is verified during the exam at the end of the semester (carried out in a stationary or remote mode (e-Kursy platform), depending on the situation). The exam covers four branches of analytical chemistry (alkacimetry, redoximetry, complexometry and precipitation 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 tasks, differently scored depending on their level of difficulty. Passing threshold: 55% of points.
After each completion of the laboratory exercise, the student is required to make a written report.

Programme content

The program covers the following topics:
1. Analysis and evaluation of hazards in work processes.
2. Volumetric analysis based on acid-base, oxidation and reduction, complexation and precipitation reactions.

Course topics

Practical aspects of analytical chemistry: basics of solution chemistry: ionic activity and ionic strength in solutions of strong and weak electrolytes; equilibrium in acid-base reactions, oxidation and reduction, complexation and precipitation; methods and techniques of volumetric analysis (titration curves, indicators, analytical calculations in alkacimetric, redoximetric, complexometric and precipitation titrations):
1. Analysis and assessment of hazards occurring in work processes. Risk assessment.
2. Volumetric analysis based on reactions:
• Acid - base
Preparation of standard solutions of 0.1 M hydrochloric acid and 0.1 M sodium hydroxide. Adjustment of the acid titer to anhydrous sodium carbonate and the sodium hydroxide titer to the previously standardized acid solution. Determination of acetic acid. Co-determination of sodium hydroxide and carbonate using the Warder method.
• Oxidation and reduction
Manganometric determination of Ca2+ ions, bromianometric determination of salicylic acid.
• Complexation

Co-determination of Ca2+ and Mg2+ ions.
• Precipitation of precipitates
Determination of chlorides using the Mohr method, determination of chlorides using the Volhard method.
Gravimetric determination of nickel.

Teaching methods

1. Lecture: multimedia presentation, discussion.
2. Laboratory exercises: performing practical exercises in accordance with the plan of the subject and a written report including recording the appropriate chemical reactions together with mathematical calculations constituting a quantitative analysis.

Bibliography

Basic:
1. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy chemii analitycznej, t.1 i 2, WNT Warszawa 2006/2007
2. J. Minczewski, Z. Marczenko, Chemia analityczna, t.1 i 2, WN PWN Warszawa 2007
3. A. Cygański, Chemiczne metody analizy ilościowej, WNT Warszawa 2005
4. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WNT Warszawa 2004
5. M. Wesołowski, K. Szefer, D. Zimna, Zbiór zadań z analizy chemicznej,WNT Warszawa 2002

Additional:
1. W. Ufnalski, Równowagi jonowe, WNT Warszawa 2004
2. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, WN PWN Warszawa 1992
3. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, WN PWN Warszawa 1993

Breakdown of average student's workload

	Hours	ECTS
Total workload	128	5,00
Classes requiring direct contact with the teacher	64	3,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	64	2,00