COURSE DESCRIPTION CARD - SYLLABUS

Course name
Instrumental analysis [S1IFar2>AI]

Course

Field of study
Pharmaceutical Engineering

Year/Semester
2/4

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
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of inorganic and analytical chemistry, apparatus used in the chemical laboratory, mathematical tools used in the chemical calculations. Usage a of basic chemical apparatus and volumetric glassware.

Course objective

To familiarize students with instrumental techniques (apparatus, physicochemical phenomena, quantitative and qualitative analysis). Presentation of instrumental techniques: absorption atomic spectrometry (F AAS, ET AAS), optical emission spectrometry (OES) inductive coupled plasma (ICP), microwave induced plasma (MIP), direct current plasma (DCP), UV-VIS spectrophotometry, gas and liquid chromatography, electroanalytical techniques, mass spectrometry). Possibility of using these techniques in the pharmaceutical and medical analysis. Calculations based on obtained data including method validation.

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 analysis [K_W4]
2. Student has theoretically founded general knowledge in the field of analytical chemistry and instrumental analysis [K_W4]
3. Knows classical and instrumental methods used in assessing the quality of substances for pharmaceutical purposes and in quantitative analysis in medicinal products [K_W7]

Skills:
1. Student can obtain the necessary information from the literature to conduct the determination of an analyte in a real sample [K_U01]
2. Student is able to perform basic chemical analyzes, interprets the results of analyzes and draws appropriate conclusions [K_U2, K_U03, K_U5, K_U10]

Social competences:
1. Students can understand the need for self-education and raising their competences in the field of instrumental analysis [K_K1]
2. Student is able to work both individually and in team during the laboratory work [K_K2]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Knowledge acquired in the course is verified during exam conducted either onsite or remotely (via the eKursy platform) depending on the form of the class. Credit threshold: 55% of the points.
A series of laboratory exercises in instrumental analysis is preceded by a test of knowledge of the theoretical basis related to the instrumental techniques used. Students prepare written reports on the exercises performed.

Programme content

The program covers the following topics:
1. Basic physicochemical phenomena in instrumental analysis.
2. Measurement of the analytical signal.
3. Atomic spectrometry.
4. UV-VIS spectrophotometry.
5. Electrochemical methods.
6. Chromatographic methods.
7. Mass spectrometry.

Course topics

Theoretical basis of physicochemical phenomena leading to the analytical signal measurement, signal measurement methods, analytical characteristics of the method. Instrumental techniques: atomic absorption and emission spectrometry, UV-VIS spectrophotometry, electrochemical methods, gas and liquid chromatography, mass spectrometry, continuous and flow injection analysis.

Teaching methods

1. Lecture: multimedia presentation supported with examples presented on the blackboard.
2. Laboratory classes: analyte determinations using analytical apparatus in accordance with the instructor's directions.

Bibliography

Basic:
1. D.A. Skoog, D.M. West, F.J. Holler, S.R. Crouch, Podstawy Chemii Analitycznej T. 1 i 2, PWN, Warszawa, (1) 2006, (2)2007
2. J. Minczewski, Z. Marczenko, Chemia Analityczna. Analiza Instrumentalna T. 1-3, PWN, Warszawa, 1,2 (2007), 1(1985)
3. A. Cygański, Chemiczne metody analizy ilościowej, WNT Warszawa, 2019

4. A Cygański, Metody spektroskopowe w chemii analitycznej, WNT, Warszawa, 2020
5. Z. Witkiewicz, J. Kałużna-Czaplińska, Podstawy chromatografii i technik elektromigracyjnych, PWN, Warszawa, 2017
6. A Cygański, Metody elektroanalityczne, WNT, Warszawa, 1999
7. I. Baranowska (red.) Analiza śladowa - Zastosowania, Wydawnictwo MALAMUT, Warszawa, 2013
8. Chemiczna analiza środków leczniczych (Leki proste), skrypt z chemii leków, Uniwersytet Gdański 2010
9. J. Namieśnik, P. Konieczka, B. Zygmunt, Ocena i kontrola jakości wyników analitycznych, WNT, 2014
10. A. Cygański, B. Ptaszyński, J. Krystek, Obliczenia w chemii analitycznej, WNT Warszawa, 2004
11. M. Wesołowski, K. Szefer, D. Zimna, Zbiór zadań z analizy chemicznej,WNT Warszawa, 2002

Additional:
1. Ślachciński, M., Modern chemical and photochemical vapor generators for use in optical emission and mass spectrometry, Journal of Analytical Atomic Spectrometry, 2019, 34(2), 257-273
2. W. Ufnalski, Równowagi jonowe, WNT Warszawa 2004
3. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, WN PWN Warszawa 2012
4. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, WN PWN Warszawa 2020
5. J. Dojlido, J. Zerbe, Instrumentalne metody badania wody i ścieków, Arkady, Warszawa 1997

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	50	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	50	2,00