



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Instrumental Analysis

Course

Field of study

Pharmaceutical Engineering

Area of study (specialization)

-

Level of study

First-cycle studies

Form of study

full-time

Year/Semester

2/4

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

30

Laboratory classes

15

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

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Wydział Technologii Chemicznej

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Responsible for the course/lecturer:

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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.

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_W04
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 the real sample. K_U01
2. Student is able to perform basic chemical analysis, interprets the results of analyzes and draw 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 during the lectures is verified during the written exam, carried out in a stationary or remote mode via e-Kursy platform, containing 10 questions with different scores depending on the degree of difficulty. Passing threshold: 55% of points.

Programme content

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

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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 elektroanalizy, 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
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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 1. W. Ufnalski, Równowagi jonowe, WNT Warszawa 2004
2. A. Hulanicki, Reakcje kwasów i zasad w chemii analitycznej, WN PWN Warszawa 2012
3. Z. Galus, Ćwiczenia rachunkowe z chemii analitycznej, WN PWN Warszawa 2020
4. J. Dojlido, J. Zerbe, Instrumentalne metody badania wody i ścieków, Arkady, Warszawa 1997



Breakdown of average student's workload

	Hours	ECTS
Total workload	90	3,0
Classes requiring direct contact with the teacher	50	1,7
Student's own work (literature studies, preparation for laboratory classes, preparation for tests/exam) ¹	40	1,3

¹ delete or add other activities as appropriate