UNIWERSYTET IM. ADAMA MICKIEWICZA W POZNANIU

Analytical chemistry

Educational subject description sheet

Basic information

Study programme Chemistry **Speciality** - **Organizational unit** Faculty of Chemistry **Study level** Second-cycle programme **Study form** Full-time **Education profile** General academic	**Didactic cycle** 2024/25 **Subject code** 02CHSS.22P.00981.24 **Lecture languages** English **Course type** Obligatory **Block** Basic subjects

Subject coordinator	Marcin Frankowski
Lecturer	Marcin Frankowski, Anetta Zioła-Frankowska, Iwona Kurzyca, Łukasz Wolski, Dorota Jakkielska

Period	**Activities and hours**	**Number of ECTS points**
Semester 2	• Lecture: 15, Exam • Laboratories: 60, Graded credit	7

Goals

Code	Goal
C1	Transfer of knowledge in the field of principles of operation of analytical instruments, application of analytical techniques and analytical procedures (sample collection and sample preparation procedures) as well as safety rules in laboratory.
C2	Skills development in method application and analytical problem-solving.
C3	Prepare for proper interpretation of experimental results.
C4	Development of writing skills in the range of reports from project laboratory work.
C5	Skills development in literature searching.

Entry requirements

No prerequisites required.

Subject learning outcomes

Code	Outcomes in terms of	Learning outcomes	Examination methods
Knowledge – Student:			
W1	knows and understands the construction of analytical instrumentation and indicates the possibility of its application.	CHS_K2_W01, CHS_K2_W07	Written exam, Report
W2	knows and understands the principles of analytical instrumentation.	CHS_K2_W01, CHS_K2_W07	Written exam, Report
W3	knows and understands the following analytical techniques: UV-Vis, AAS, potentiometry, conductometry, ICP-MS, ICP-OES, HPLC.	CHS_K2_W01, CHS_K2_W07	Written exam, Report
W4	knows and understands appropriate analytical techniques depending on the sample type and matrix.	CHS_K2_W01, CHS_K2_W07	Written exam, Report
W5	knows and understands how to correctly interpret the results of analytical determinations.	CHS_K2_W01, CHS_K2_W07	Written exam, Report
W6	knows and understands how to prepare a report on the analytical determination.	CHS_K2_W01, CHS_K2_W09	Written exam, Report
Skills – Student:			
U1	is able to obtain information from the literature, allowing for planning and carrying out the determination of the selected ingredient(s) in a food sample.	CHS_K2_U01, CHS_K2_U08, CHS_K2_U10, CHS_K2_U12	Written exam, Report
U2	is able to perform basic chemical calculations for comparative methods, including the ability to prepare appropriate concentrations of solutions.	CHS_K2_U01, CHS_K2_U08, CHS_K2_U10, CHS_K2_U13	Written exam, Report
U3	is able to discuss and proposes appropriate analytical tools in order to perform reliable measurements.	CHS_K2_U01, CHS_K2_U06, CHS_K2_U13, CHS_K2_U14	Written exam, Report

Code	Outcomes in terms of	Learning outcomes	Examination methods
U4	is able to prepare the apparatus for the determination, including the appropriate solutions, while observing the rules of safe work in the laboratory.	CHS_K2_U01, CHS_K2_U07, CHS_K2_U12	Written exam, Report
U5	is able to interpret the results of the analyzes and prepares the appropriate research report.	CHS_K2_U01, CHS_K2_U08, CHS_K2_U09, CHS_K2_U10, CHS_K2_U13, CHS_K2_U14	Written exam, Report
U6	is able to work both individually and in a team during laboratory work.	CHS_K2_U01, CHS_K2_U14, CHS_K2_U15	Written exam, Report
Social competences – Student:			
K1	understands the need for self-education and improving their professional competences.	CHS_K2_K01, CHS_K2_K02, CHS_K2_K03, CHS_K2_K04	Written exam, Report
K2	is aware of the principles of ethics and work in the analytical laboratory.	CHS_K2_K01, CHS_K2_K02, CHS_K2_K03, CHS_K2_K04	Written exam, Report
K3	is aware of the responsibility for the performed determinations and has the appropriate knowledge of the acceptable content of selected analytes in food samples.	CHS_K2_K01, CHS_K2_K02, CHS_K2_K03, CHS_K2_K04	Written exam, Report

Study content

No.	Course content	Subject learning outcomes	Activities
1.	Occupational health and safety in the laboratory and basic analytical chemistry.	W2, U1, U6, K1, K2, K3	Lecture, Laboratories
2.	UV-Vis spectrometry.	W1, W2, W3, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
3.	Atomic absorption spectrometry.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
4.	Potentiometry, conductometry, woltamperometry.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
5.	Inductively Coupled Plasma MS.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
6.	Inductively Coupled Plasma OES.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
7.	Gas chromatography.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories

No.	Course content	Subject learning outcomes	Activities
8.	Liquid chromatography.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
9.	Ion Chromatography.	W1, W2, W3, W4, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories
10.	Standards, Reference Materials and correct interpretation and verification of the measurements results on the basis of relevant statistical calculations.	W5, W6, U1, U2, U3, U4, U5, U6, K1, K2, K3	Lecture, Laboratories

Additional information

Activities	Teaching and learning methods and activities
Lecture	Lecture with a multimedia presentation of selected issues, Problem-based lecture, Discussion
Laboratories	Laboratory method, Research method (scientific inquiry), Work in groups

Activities	Credit conditions
Lecture	The exam will be in written form. The final mark will base on points obtained on a written exam as well as on points collected on laboratories. Grading scale with applied percentage distribution: • excellent (5.0): achievement of the student's expected learning outcomes at a minimum of 90.0%. • very good (4.5): achievement by the student of the desired learning outcomes ranging from 80.0% - 89.9%. • good (4.0): achievement of student learning outcomes 70.0% - 79.9%. average (3.5): achievement of student learning outcomes 60.0% - 69.9%. • satisfactory (3.0): attainment of the student learning outcomes within 50.0% - 59.9%. • unsatisfactory (2.0): failure of the student to achieve the expected learning outcomes below 50.0%.
Laboratories	Submission of a complete lab report within 7 days via the Moodle platform. The teacher provides information about the lab. template: what should be included in it and what necessary calculations should be included there. Additionally, on the Moodle platform there are Prelab questions that should also be attached to the report. It makes up the whole thing also the grade obtained from the colloquium in the Question Bank located on the Moodle. Grading scale with applied percentage distribution: • excellent (5.0): achievement of the student's expected learning outcomes at a minimum of 90.0%. • very good (4.5): achievement by the student of the desired learning outcomes ranging from 80.0% - 89.9%. • good (4.0): achievement of student learning outcomes 70.0% - 79.9%. • average (3.5): achievement of student learning outcomes 60.0% - 69.9%. • satisfactory (3.0): attainment of the student learning outcomes within 50.0% - 59.9%. • unsatisfactory (2.0): failure of the student to achieve the expected learning outcomes below 50.0%.

Literature

Obligatory

1. Curreli, G., "Analytical instrumentation", Wiley, Chichester 2000
2. Harvey D., Modern analytical chemistry, McGraw-Hill Companies Inc. 2000
3. Fundamentals of Analytical Chemistry 9th Edition by Douglas A. Skoog et al. 2013
4. Standard Methods 2020

Calculation of ECTS points

Activities	**Activity hours***
Lecture	15
Laboratories	60
Preparation for classes	40
Reading the indicated literature	30
Report preparation	30
Preparation for the exam	20
Other	15
Student workload	**Hours** 210
Number of ECTS points	**ECTS** 7

* academic hour = 45 minutes

Efekty uczenia się dla kierunku

Kod	Treść
CHS_K2_K01	The graduate is ready to identify and evaluate cognitive and practical problems in the field of chemical research
CHS_K2_K02	The graduate is ready to evaluate the collected information critically
CHS_K2_K03	The graduate is ready to propose alternative solutions aimed at responsible decision-making, taking into account economic and social factors
CHS_K2_K04	The graduate is ready to appreciating, promoting and adhering to professional ethics in their own and others' activities
CHS_K2_U01	The graduate can use chemical terminology consistent with IUPAC recommendations
CHS_K2_U06	The graduate can use analytical and instrumental techniques to describe the qualitative and quantitative interpretation of chemical phenomena
CHS_K2_U07	The graduate can prepare a final report on conducted research projects and conduct a critical analysis of experiments
CHS_K2_U08	The graduate can find and use information obtained from databases and literature resources in order to plan and carry out a research project
CHS_K2_U09	The graduate can use information and communication techniques in order to deepen his knowledge and communication in specialist circles of recipients
CHS_K2_U10	The graduate can use English at the B2 + level of the European System for the Description of Language Education in the field of chemistry and the discipline in which conducts research
CHS_K2_U12	The graduate can draw conclusion properly and evaluate critically on the basis of data from self-conducted chemical or physicochemical experiments and literature resources
CHS_K2_U13	The graduate can deepens his specialistic knowledge to the extent necessary to solve and interpret the undertaken problem correctly
CHS_K2_U14	The graduate can express in an accessible way the acquired knowledge, conduct a debate and present the results of scientific projects in chemistry
CHS_K2_U15	The graduate can work in a group, performing various roles, including a leader
CHS_K2_W01	The graduate knows and understands selected advanced issues in the field of chemistry
CHS_K2_W07	The graduate knows and understands classifies advanced laboratory, analytical and instrumental techniques used in chemistry
CHS_K2_W09	The graduate knows and understands the ethical, legal and economic conditions applicable in the field of chemical sciences