

Course title Metody separacyjne/ Separation methods		ECTS code 13.3.1011	
Name of unit administrating study			
Faculty of Chemistry			
Studies			
Field of study	Type	Form	
Chemistry	Bachelor	Full-time studies	
Teaching staff Dr hab. Monika Paszkiewicz			
Forms of classes, the realization and number of hours		ECTS credits	
A. Forms of classes, in accordance with the UG Rector's regulations lecture, audytorium classes, laboratory classes		classes 90 h tutorial classes 5 h student's own work 30 h TOTAL: 125 h - 5 ECTS	
B. The realization of activities In-class learning			
C. Number of hours Lecture 30 h, audytorium classes 15 h, laboratory classes 45 h			
The academic cycle Second year, summer semester			
Type of course obligatory		Language of instruction Polish	
Teaching methods Lecture with multimedial presentation Laboratory experiments Rozwiązanie zadań		Form and method of assessment and basic criteria for evaluation or examination requirements	
		A. Final evaluation, in accordance with the UG study regulations Course completion (with a grade)	
		B. Assessment methods determining the final grade based on partial grades received during the semester; written exam with open questions, test exam;	
		The basic criteria for evaluation Lecture <ul style="list-style-type: none"> • a positive grade is min. 51% of points possible to obtain from the written exam covering the scope of material carried out during lectures and auditorium and laboratory exercises, • a negative grade can be improved on the basis of an additional written exam from material carried out during lectures and laboratory exercises (min. 51% of points possible) Auditorium exercises <ul style="list-style-type: none"> • a positive grade is min. 51% of points possible to obtain from partial colloquia covering the scope of material carried out during the exercises. • negative grade can be improved on the basis of an additional test from material covering the whole range of exercises (min 51% of points possible). Laboratory exercises	

- The grade will be a weighted average of grades from the final colloquium of all laboratory material (50%), partial tests (35%) and reports (15%).
- Negative grade can be improved on the basis of an additional colloquium from the material covering the entire range of exercises (min 51% of possible points).

Required courses and introductory requirements

- A. Formal requirements** General chemistry, Organic chemistry, Inorganic chemistry, Analytical chemistry
- B. Prerequisites** General chemistry, Organic chemistry, Inorganic chemistry, Analytical chemistry.

Aims of education

- introduction to basic separation techniques,
- introduction into the basics of calculations necessary for the correct interpretation of the results of analyzes,
- introduction to the theoretical basis of chromatographic techniques,
- acquaintance with the construction of chromatographic equipment and the basic parameters of its work,
- introduction in the principles of selection of analytical conditions based on the physicochemical properties of the analyzed effects,
- acquiring the skills of independent design and implementation of separation processes, isolation and isolation of selected chemical compounds by major separation techniques,
- obtaining practical skills related to the procedure in the chromatographic laboratory.

Course contents

A. Problems of the lecture: Classification of separation methods. Theoretical basis of the chromatographic process. Preparation of samples for analysis, types of extraction techniques, extraction of solid, liquid and gas samples. Gas chromatography: carrier gas, injector type, columns, detectors, selection of measurement parameters. High performance liquid chromatography: pumps, injector, detectors, column - stationary phase types, mobile phases. Chromatography in normal and reverse phase. Other chromatographic techniques: exclusion chromatography and ion chromatography. Theoretical basis of electromigration techniques.

B. Problems of auditorium exercises: basic computational methods used in separation techniques, eg determination of solution concentrations, extraction efficiency, chromatographic parameters. Calculation methods used in quantitative and qualitative analysis.

C. Problems of laboratory exercises: Extraction techniques; separation and analysis of chemical compounds by chromatographic techniques (GC, HPLC, TLC).

Bibliography of literature

- A. Wykaz literatury
- A. Literatura wymagana do ostatecznego zaliczenia zajęć (zdania egzaminu):
- A.1. wykorzystywana podczas zajęć
Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.
Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.
- A.2. studiowana samodzielnie przez studenta
Stepnowski P., Synak E., Szafranek B., Kaczyński Z. Techniki separacyjne. Wydawnictwo UG 2010
Witkiewicz Z. Podstawy chromatografii, WNT, Warszawa, 2005.
Szczepaniak W. Metody instrumentalne w analizie chemicznej, PWN, Warszawa, 1996.
- B. Literatura uzupełniająca
Kocjan R. Chemia analityczna. Podręcznik dla studentów. Tom 2. PZWL, Warszawa, 2000.

Witkiewicz Z., Hepter J. Chromatografia gazowa, WNT, Warszawa, 2009.
Minczewski J., Marczenko Z., Chemia analityczna, tom III, PWN, W-wa, 1986

Knowledge

1. knows the basics of separation techniques,
2. knows and understands the theoretical basis of the chromatographic process
3. defines the basic parameters in the chromatographic analysis,
4. knows the structure and principle of operation of the basic research apparatus used for chromatographic separations,
5. can present the basic methods of quantitative and qualitative analysis,
6. draws simple conclusions from experimental data.

Skills

1. Can independently operate uncomplicated research equipment,
2. Talks about issues related to separation techniques in understandable language, using the correct nomenclature,
3. can plan and perform simple experimental tests
4. is able to optimize the basic parameters of the measuring apparatus based on experimental data,
5. knows the need to follow established analytical procedures,
6. can perform simple quantitative and qualitative analyzes

Social competence

1. understands the need for further education,
2. shows responsibility for the effects of team work,
3. promotes the importance of mathematical sciences in explaining many phenomena and processes,
4. is responsible for the safety of own and other work: knows how to deal with emergencies, is careful when handling chemicals, is careful when handling measuring instruments.