University of Gdańsk

Subject card

Subject name and code	Chromatography techniques in practice, PG_00185541		
Field of study	Chemistry		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2026/2027
Education level	Master's studies	Subject group	Optional subject group
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	1	Language of instruction	Polish
Semester of study	2	ECTS credits	1.0
Learning profile	academic	Assessment form	credit
Conducting unit	Department of Environmental Analysis -> Faculty of Chemistry -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Monika Paszkiewicz	
	Teachers	dr Joanna Dołżonek	

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						

Learning activity and number of study hours	Learning activity	Participation in didactic classes included in study plan	Participation in consultation hours	Self-study	SUM
	Number of study hours	15	2.0	8.0	25

Subject objectives	To provide the student with theoretical knowledge of separation and detection techniques and practical aspects of the application of various techniques chromatographic techniques. To acquire the ability to design chromatographic separations in GC and LC on the basis of variations in operational parameters operational parameters and chemical structures of analytes.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	- Predicts the effect of process parameters on the retention time of an analyte with a given structure - Determines the efficiency of the chromatographic column and, based on its parameters, determines the degree of column degradation	[SU4] test/exam - oral or written
[CHEMMU2_W04] Applies the acquired knowledge to an in-depth description of the properties of chemical connections, methods of their synthesis and analysis.	- Lists and characterises the chromatographic techniques most commonly used for analytical and preparative purposes - Describe the phenomena occurring during chromatographic analysis, and understand their effect on the separation process - Characterise methods of quantitative and qualitative analysis in chromatography	[SW4] test/exam - oral or written
[CHEMMU2_K04] Correctly identifies and resolves dilemmas related to the profession of a chemist.	- Understands the need to follow the literature on chromatographic techniques and their development trends and to continuously deepen and broaden his/her knowledge	[SK8] observation of student's independent or team work
[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	- Has an in-depth knowledge of the basic operations involved in performing chromatographic separations	[SW4] test/exam - oral or written
[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	- Has knowledge of the construction and principles of operation of the apparatus used in liquid and gas chromatography - Has an in-depth knowledge of the basic operations involved in performing chromatographic separations	[SW4] test/exam - oral or written
[CHEMMU2_U02] Critically assesses the results of conducted, performed observations and theoretical calculations and discusses errors.	- Independently operates the testing apparatus used in the exercises of this subject - Follows established analytical procedures - Recognises the most common problems encountered in chromatographic analysis and indicates possibilities of eliminating them - Evaluates critically the results of chromatographic separations, discusses errors, identifies their sources and, if possible, suggests possible ways of eliminating them, - Prepares a report of the performed experiments	[SU2] presentation/project/paper/ report [SU4] test/exam - oral or written
[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	- Understands the need for further education and broadening of knowledge - Understands the social aspects of practical application of acquired knowledge	[SK8] observation of student's independent or team work

Subject contents

Theory of chromatographic separations, resolution and theoretical plates, band broadening and diffusion phenomena, general resolution equation vs. peak symmetry, key operating variables of chromatographic systems, calibration methods, columns and stationary phases in GC, temperature programming in GC, GC instrumentation, injectors and injection methods, detectors in GC, retention indices and McReynolds constants, derivatisation of analytes, tandem GC, LC stationary phases, modes of separation in LC (normal, inverse, ion-exchange, HILIC, SEC, affinity), HPLC instrumentation, injectors and detectors, chiral separations, ultra-high performance liquid chromatography (UHPLC), two-dimensional liquid chromatography (2D-LC).

Prerequisites and co-requisites

Requirements:
Completed courses: general chemistry, physical chemistry, organic chemistry, analytical chemistry
Additional requirements:
Knowledge of: basics of chromatography;chemical equilibria, adsorption process, partitioning between two liquid phases, liquid and gas phase, solid and gas phase, mass exchange process between phases; acid-base equilibria; van der Waals, dispersion, hydrophobic, ion-ion interactions, hydrogen bonds and solvation phenomenon; refraction and light scattering phenomena, UV-VIS spectroscopy; isomerism phenomena with special emphasis on optical isomerism

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Written exam with test and open questions	51.0%	100.0%

Recommended reading	Basic literature	J. Kalużna-Czaplińska, Z. Witkiewicz. Fundamentals of chromatography and electromigration techniques. PWN, 2021 J. Kałużna-Czaplińska, Z. Witkiewicz. Fundamentals of chromatography and electromigration techniques. PWN, 2021 Z. Witkiewicz, W. Wardencki, I. Malinowska. Liquid chromatography. Theory and practice. PWN, 2019 Z. Witkiewicz, W. Wardencki, I. Gas chromatography. PWN, 2018
	Supplementary literature	M. F. Vitha Chromatography. Principles and Instrumentation. Wiley. 2017 L Snyder i in. Practical HPLC Method Development. Wiley 1997 The HPLC Expert. Possibilities and Limitations of Modern High Performance Liquid Chromatography S. Kromidas (ed.). Wiley 2016
	eResources addresses	
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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