University of Gdańsk

Subject card

Subject name and code	Fundamentals of Chromatography, PG_00188307						
Field of study	Podstawy chromatografii (Ćw.laboratoryjne)						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Bachelor's studies		Subject group		Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
Mode of study	full-time studies		Mode of delivery		at the university		
Year of study	2		Language of instruction		Polish		
Semester of study	4		ECTS credits		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Klaudia Godlewska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	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	30		2.0		3.0	35
Subject objectives	Acquiring practical skills in performing chromatographic analyses using basic techniques (TLC, GC, HPLC). Learning the principles of sample preparation for analysis and assessing the impact of this step on the final result. Developing skills in working with chromatographic equipment, including calibration, setting operating parameters, and operating data acquisition systems. Developing competencies in chromatogram interpretation, peak identification, and assessing the quality of obtained data (repeatability, selectivity, sensitivity). Learning the principles of qualitative and quantitative analysis using chromatographic techniques used in forensic analysis. Developing skills in critically assessing the reliability of results and solving common analytical problems that arise during laboratory work.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[AKRL3_W03] The graduate knows and understands the structure and chemical properties of compounds relevant in forensic examinations.	The student will understand the basic groups of chemical compounds relevant to forensic analysis (e.g., drugs, toxins, volatile organic substances, explosive compounds) and their properties that determine the method of chromatographic analysis. They will understand how chemical structure and physicochemical properties (polarity, volatility, stability, molecular weight) influence the behavior of compounds during chromatographic separation.	[SW4] test/egzamin - ustny lub pisemny
	[AKRL3_W02] The graduate knows and understands, at an advanced level, the analytical methods used in forensic laboratories, in particular spectroscopic, chromatographic and electroanalytical methods.	The student explains the theoretical foundations of chromatography (partitioning, retention mechanisms, separation parameters). Describes the structure and operation of basic types of chromatographs (GC, HPLC) and their components (detectors, columns, dispensing systems). Distinguishes chromatographic techniques used in forensic laboratories and can identify their main applications. Describes key spectrometric and electroanalytical methods at a level sufficient to select the appropriate technique for a specific research problem. Understands the principles of combined techniques (e.g., GC-MS, LC-MS) and their importance in trace analysis and substance identification in forensic cases.	[SW4] test/egzamin - ustny lub pisemny [SW1] wypowiedź ustna/rozmowa/ dyskusja
	[AKRL3_U02] The graduate can plan and organize individual and team work and collaborate with others in team projects (including interdisciplinary teams).	The student can plan the chromatographic analysis process within a team, dividing tasks and coordinating group activities. Collaborates effectively within a laboratory team, adhering to the principles of communication, safety, and responsibility for the shared analytical result. Can organize own work at the chromatographic workstation, prepare samples and reagents within a set timeframe, and support the work of other group members. Resolves analytical problems within the group, proposing joint actions in the event of errors, incorrect chromatograms, or instrument failures. Documents teamwork results, prepares joint reports, and interprets results taking into account the work of all group members.	[SU2] prezentacja/projekt/referat/ raport [SU5] realizacja zadania problemowego
	[AKRL3_K06] The graduate is ready to follow occupational health and safety regulations in the laboratory and care for the safety of themselves and others.	The student applies occupational health and safety principles in the chromatography laboratory. Ensures their own safety and that of other laboratory participants by handling reagents and equipment appropriately.	[SK8] obserwacja samodzielnej lub zespołowej pracy studenta

Course outcome	Subject outcome	Method of verification
[AKRL3_U04] The graduate is able to select appropriate equipment for experiments and prepare reports and expert opinions based on analytical results in compliance with legal and ethical standards.	The student can select appropriate chromatographic equipment (columns, detectors, consumables) for the sample type and analytical purpose. Independently configures and prepares chromatographic equipment for work (HPLC, GC – depending on the scope of the exercises). Accurately documents the course of experiments and instrument operating conditions in a laboratory journal. Prepares chromatographic analysis results in reports consistent with forensic laboratory procedures. Interprets chromatograms and identifies potential errors resulting from instrument operation or improper procedures. Formulates conclusions and presents expert opinions based on the obtained analytical data, taking into account legal requirements and professional ethics.	[SU2] prezentacja/projekt/referat/ raport [SU5] realizacja zadania problemowego
[AKRL3_U03] The graduate is able to perform analyses using instrumental methods (spectroscopy, chromatography, microbiological tests) and interpret research results.	The student can independently prepare a sample for chromatographic analysis using basic extraction and purification techniques. Performs measurements using selected chromatographic techniques (e.g., GC, HPLC) in accordance with laboratory procedures. Can perform basic method validation (e.g., repeatability, linearity) at the level necessary for laboratory analysis. Interprets chromatograms and assesses the quality of obtained results, identifies possible errors, and is able to propose corrective actions. Can perform simple quantitative and qualitative analysis using chromatographic data.	[SU2] prezentacja/projekt/referat/ raport [SU6] demonstracja umiejętności praktycznych
[AKRL3_K02] The graduate is ready to make reliable, objective decisions and take responsibility for the interpretation of research results.	The student is able to make reliable and objective decisions when interpreting chromatographic results. They take responsibility for the accuracy of analyses and conclusions drawn from laboratory experiments.	[SK2] prezentacja/projekt/referat/ raport

Subject contents	Chromatography basics: separation principles, types of chromatography (HPLC, GC, TLC). Sample preparation for analysis: extraction, purification, selection of the appropriate method. Influence of instrumental parameters on separation and chromatogram quality. Qualitative and quantitative analysis of sample components, interpretation of chromatograms. Introduction to method validation: precision, accuracy, limits of detection and quantification. Result documentation: laboratory reports, preparation of expert conclusions. Teamwork, organization of laboratory work, collaboration, and division of tasks. Occupational health and safety principles in the chromatography laboratory. Reliable and responsible interpretation of analytical results.
Prerequisites and co-requisites	Completed courses: chemistry, organic chemistry, and analytical chemistry. Knowledge of basic concepts in general chemistry, organic chemistry, analytical chemistry, and instrumental analysis methods.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final test	51.0%	40.0%
Short entrance tests	51.0%	40.0%
Report on each exercise performed	51.0%	20.0%

Recommended reading

Basic literature

Skoog, D.A., Holler, F.J., Crouch, S.R., *Principles of Instrumental Analysis*, 8th Edition, Cengage, 2018

Poole, C.F., *Gas Chromatography*, 7th Edition, Elsevier, 2012

Poole, C.F., *Liquid Chromatography: Principles, Techniques, and Applications*, 3rd Edition, Elsevier, 2011

Berger, T., & Fekete, S., *Introduction to Chromatography in Forensic Science*, Elsevier, 2018

Harris, D.C., *Quantitative Chemical Analysis*, 9th Edition, W.H. Freeman, 2016

Emiliani, C., Fekete, S., & Berger, T., *Chromatography: A Science for the 21st Century*, Elsevier, 2020

	Supplementary literature	Snyder, L.R., Kirkland, J.J., Dolan, J.W., *Introduction to Modern Liquid Chromatography*, 3rd Edition, Wiley, 2010 Poole, C.F., *Gas Chromatography and Mass Spectrometry: A Practical Guide*, 2nd Edition, Wiley, 2004 Meyer, V.R., *Practical High-Performance Liquid Chromatography*, 6th Edition, Wiley, 2010
	eResources addresses	
Example issues/ example questions/ tasks being completed	Overview of chromatography basics: separation principles, types of chromatography (LC, GC, TLC). Selection of stationary and mobile phases depending on the sample and analyte type. Sample preparation: extraction, purification, and the influence of sample matrix on analytical results. Interpretation of chromatograms: identification and quantification of sample components. Examples of the use of coupled techniques (GC-MS, LC-MS) in the context of forensic laboratory analysis. Qualitative and quantitative analysis: the difference between quantitative and qualitative analysis in chromatography. Method validation: precision, accuracy, limits of detection and quantification. Documenting results: preparing laboratory reports and expert conclusions. Teamwork: task planning, division of responsibilities, and collaboration on experiments. Practical problem-solving: e.g., optimizing separation parameters, detecting analytical errors.	
Work placement	Not applicable	

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