

Subject card

Subject name and code	The chemistry of odor in forensic science, PG_00211798						
Field of study	Forensic Analytics						
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 Optional subject group		
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	Department of Environmental Technology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Dagmara Jacewicz, prof. UG				
	Teachers						
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	The aim of the course is to introduce students to the chemical principles underlying the formation, emission, transport and degradation of odour as a potential forensic trace. Students will become familiar with the main classes of volatile organic compounds (VOCs), their properties and the factors affecting the composition and persistence of odour profiles. The course also aims to present methods for collecting and analysing odour samples and to develop students' ability to critically interpret analytical results. Particular emphasis will be placed on assessing the reliability of results, recognising the limitations of analytical methods and understanding the evidential value of odour in forensic science.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[AKRL3_K02] The graduate is prepared to make reliable, objective, and socially responsible decisions and to assume responsibility for the interpretation of research results, being aware of their impact on evidentiary procedures and the functioning of the justice system.	The student is prepared to critically, reliably and responsibly interpret the results of odour analysis and to formulate conclusions taking into account the limitations of the methods used and their potential evidential consequences.	[SK2] presentation/project/paper/report
	[AKRL3_W09] The graduate knows and understands the principles of documentation, securing, and interpreting evidence material, as well as the use of microscopic and spectroscopic methods.	The student knows and understands the principles of documenting, collecting, preserving and interpreting odour evidence, as well as the use of SPME for sample preparation and GC-MS for the analysis of volatile organic compounds.	[SW2] presentation/project/paper/report
	[AKRL3_W03] The graduate knows and understands the structure and chemical properties of compounds relevant in forensic examinations.	The student knows the structure, physicochemical properties and main classes of volatile organic compounds relevant to odour analysis and understands the relationship between their chemical structure, volatility, stability and odour properties.	[SW2] presentation/project/paper/report
	[AKRL3_U10] The graduate is able to interpret data from different analytical techniques to reconstruct events or identify evidence material.	The student interprets odour profiles obtained using analytical techniques and assesses their usefulness for the identification of evidential material and the reconstruction of events.	[SU2] presentation/project/paper/report [SU5] implementation of a problem task
	[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 knows and understands the principles of odour sample collection and preparation and the application of SPME and GC-MS techniques in the analysis of volatile organic compounds, including the capabilities and limitations of these methods.	[SW2] presentation/project/paper/report
Subject contents	The course covers the chemical basis of odour as a complex mixture of volatile organic compounds and its significance as a potential forensic trace. It includes the main classes of odour compounds, their physicochemical properties, the relationship between chemical structure and odour perception, as well as the composition and sources of human odour, including the role of sweat glands and the skin microbiome. The course also addresses the emission, transport, adsorption, transfer and degradation of odour compounds and the effects of temperature, humidity, light and time on the persistence of odour profiles. Methods of sample collection and preparation, together with the application of SPME and GC-MS techniques in the analysis of volatile organic compounds, are presented. Particular emphasis is placed on the interpretation of results, limitations of analytical methods, reliability of odour traces as forensic evidence and emerging developments such as electronic noses and the use of artificial intelligence.		
Prerequisites and co-requisites	Basic knowledge of general and organic chemistry and fundamental concepts of instrumental analysis. No additional requirements.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Preparation and delivery of a presentation or report based on the analysis of a problem-oriented case study in forensic odour chemistry. The following will be assessed: substantive accuracy, the selection and use of literature, data interpretation, the identification of methodological limitations and sources of uncertainty, and the validity of the conclusions drawn.	51.0%	100.0%

Recommended reading	Basic literature	1. Zdybel R., Osmologia. Dowody zapachowe w kryminalistyce, Wydawnictwo Kamena, Przemysł 2009. 2. Widacki J. (red.), Widła T., Kryminalistyka, wyd. 4, Wydawnictwo C.H. Beck, Warszawa 2018. 3. Szczepaniak W., Metody instrumentalne w analizie chemicznej, Wydawnictwo Naukowe PWN, Warszawa 2007. 4. Buettner A. (ed.), Springer Handbook of Odor, Springer, Cham 2017. 5. Peters R. et al., Human Scent Characterization: A Review, „Forensic Science International” 2023, 349, 111743, DOI: 10.1016/j.forsciint.2023.111743. 6. Furton K.G., Caraballo N.I., Cerreta M.M., Holness H.K., Advances in the Use of Odour as Forensic Evidence through Optimizing and Standardizing Instruments and Canines, „Philosophical Transactions of the Royal Society B: Biological Sciences” 2015, 370(1674), 20140262, DOI: 10.1098/rstb.2014.0262.
	Supplementary literature	1. Danikiewicz W., Spektrometria mas. Podstawy i zastosowania, Wydawnictwo Naukowe PWN, Warszawa 2020. 2. Dormont L., Bessière J.-M., Cohuet A., Human Skin Volatiles: A Review, „Journal of Chemical Ecology” 2013, 39, 569-578, DOI: 10.1007/s10886-013-0286-z. 3. Cuzuel V. et al., Origin, Analytical Characterization, and Use of Human Odor in Forensics, „Journal of Forensic Sciences” 2017, 62(2), 330-350, DOI: 10.1111/1556-4029.13394. 4. Iqbal M.A., Nizio K.D., Ueland M., Forbes S.L., Forensic Decomposition Odour Profiling: A Review of Experimental Designs and Analytical Techniques, „TrAC Trends in Analytical Chemistry” 2017, 91, 112-124, DOI: 10.1016/j.trac.2017.04.009.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. A volatile organic compound profile obtained from clothing collected at a crime scene partially matches the odour profile of a suspect. Assess whether the result is sufficient for personal identification. Identify potential sources of uncertainty and propose additional examinations. 2. An odour sample was collected 48 hours after the incident and was exposed to elevated temperature, light and variable humidity. Analyse how these conditions may have affected the VOC profile and its evidential value. 3. A partially matching profile of volatile organic compounds was detected on an item belonging to the victim, on the suspect's clothing and in a shared room. Consider the possibility of primary and secondary transfer. Propose an appropriate sampling strategy and control materials that would help assess the source of the profile. 4. A detection dog indicated an odour match, whereas GC-MS analysis demonstrated only partial similarity between the profiles. Compare the significance and limitations of both results and formulate a cautious forensic conclusion. 5. Develop a procedure for the collection, preservation, storage and analysis of an odour sample obtained from an object found at a crime scene. Include SPME, GC-MS, control samples, blanks and measures preventing contamination. 6. Two odour samples collected from the same person at different times show differences in VOC composition. Assess the possible effects of diet, health, hygiene, lifestyle and sampling conditions, and determine whether the differences exclude a common source. 7. An electronic nose classified a sample as matching the suspect's profile. Propose a method for verifying the result using instrumental analysis and identify the validation information required before the result can be treated as forensic evidence. 8. Using a selected case study, assess the evidential value of an odour trace, taking into account its origin, environmental conditions, possible transfer and degradation, analytical methods and limitations of interpretation.	
Work placement	Not applicable	

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