



## Subject card

Subject name and code	Monitoring and Analytics of Pollutants, PG_00045468						
Field of study	Chemical Technology						
Date of commencement of studies	February 2022	Academic year of realisation of subject			2022/2023		
Education level	second-cycle studies	Subject group			Optional subject group 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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			6.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Department of Analytical Chemistry -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Marek Tobiszewski					
	Teachers	dr hab. inż. Marek Tobiszewski prof. dr hab. inż. Bożena Zabiegała dr hab. inż. Mariusz Marć prof. dr hab. inż. Piotr Konieczka dr inż. Tomasz Majchrzak dr inż. Natalia Jatkowska prof. dr hab. inż. Andrzej Wasik dr inż. Małgorzata Rutkowska dr inż. Weronika Hewelt-Belka					
Lesson type and method of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	30.0	15.0	0.0	75
	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	75		10.0		65.0	150
Subject objectives	The aim of the subject is getting knowledge from environmental and monitoring of environment and legislation. The aim is improvement of analytical laboratory practice.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_K02] is ready to provide critical evaluation of received content and to acknowledge the importance of knowledge in solving cognitive and practical problems	understands the influence of his actions on the environment	[SK5] Assessment of ability to solve problems that arise in practice
	[K7_W02] Knows and understands, to an increased extent, selected laws of physics and physical phenomena, as well as methods and theories explaining the complex relationships between them, constituting advanced general knowledge in the field of technical sciences related to the field of study	understands the basics of environmental monitoring systems	[SW3] Assessment of knowledge contained in written work and projects
	[K7_U04] can apply knowledge of programming methods and techniques as well as select and apply appropriate programming methods and tools in computer software development or programming devices or controllers using microprocessors or programmable elements or systems specific to the field of study, making assessment and critical analysis of the prepared software as well as a synthesis and creative interpretation of information presented with it	is able to select techniques for respective groups of analytes	[SU4] Assessment of ability to use methods and tools
[K7_U05] can plan and conduct experiments related to the field of study, including computer simulations and measurements; interpret obtained results and draw conclusions	is able to interpret the results of environmental quality analyses	[SU3] Assessment of ability to use knowledge gained from the subject	
Subject contents	Organizational classes, the role of analytics and terminology Trace analytics problems Priority pollution Speciation analytics biomonitoring Green analytical chemistry Monitoring networks. Telemonitoring Anthropocene Validation of analytical procedures Passive samplers micro-plastics Radon analysis. Asbestos analysis Metabolomics and Proteomics Indoor air quality Zero exam		
Prerequisites and co-requisites	basic knowledge from environmental chemistry and analytical chemistry		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	project	50.0%	20.0%
	examination	50.0%	50.0%
	mean from laboratory classes	50.0%	30.0%
Recommended reading	Basic literature	Metody instrumentalne w kontroli zanieczyszczeń środowiska, praca zbiorowa pod red. J. Namieśnika, skrypt PG, Gdańsk 1992 Secondary effects and pollutants of the environment, J. Namieśnik, T. Górecki, W. Wardencki, B. Zygmunt, L. Torres, skrypt PG, Gdańsk 1993 Pobieranie próbek środowiskowych do analizy, J. Namieśnik, J. Łukasiak, Z. Jamrógiwicz, PWN, Warszawa 1995 Fizykochemiczne metody kontroli zanieczyszczeń środowiska, praca zbiorowa pod red. J. Namieśnika i Z. Jamrógiwicza, PWN, Warszawa 1998 Przygotowanie próbek środowiskowych do analizy, J. Namieśnik, Z. Jamrógiwicz, M. Pilarczyk, L. Torres, WNT, Warszawa 2000 Pestycydy, występowanie, oznaczanie i unieszkodliwianie, praca zbiorowa pod red. M. Biziuka, WNT, Warszawa 2001 Kontrola i zapewnienie jakości wyników pomiarów analitycznych, praca zbiorowa pod red. P. Konieczki i J. Namieśnika, WNT, Warszawa 2007 Zarys ekotoksykologii, praca zbiorowa pod red. J. Namieśnika i J. Jaśkowskiego, EKO-Pharma, Gdańsk 1995	
	Supplementary literature	-	
	eResources addresses		

Example issues/  
example questions/  
tasks being completed

Goals of environmental monitoring. What environmental compartments are monitored?

Basic analytical metrological parameters.

Why extraction is performed before final determination?

What is the goal of environmental tracers application? Give examples of environmental tracers. What requirements should it meet?

What are processes that lead to loss of liquid sample representativeness. What are the measures to avoid them?

What is speciation analysis? Explain terms: group speciation, individual speciation, screening speciation and physical speciation. Give examples.

What are advantages of total parameters application over more traditional approach to monitoring?

What are advantages of biomonitoring over more traditional approach to monitoring?

What are the requirements for bioindicator organism? Give examples of such organisms

Suggest analytical technique that can be applied to determine benzene in water samples. Suggest appropriate sampling technique, sample preparation and final determination technique.

List 5 solventless sample preparation techniques and describe two of them.

Principles of dispersive liquid-liquid microextraction technique.

List the elements of quality assurance/quality control system.

Suggest analytical technique that can be applied to determine toluene in the air during this examination. Suggest appropriate sampling technique, sample preparation and final determination technique.

Freons physicochemical properties, areas of application, environmental concerns and their naming.

Burial sites genesis, environmental problems, remediation.

Characteristics of the sample collected for analysis.

What is environmental fate of contaminants? Explain: emission, imission and transboundary pollutants.

What are the modes of location of analytical device in relation to investigated object? Which mode is the most beneficial and why?

Characteristics of clean rooms.

Process of ultrapure water production.

What parameters are TEQ and TEF?

What is environmental specimen bank?

	<p>Role and tasks of environmental specimen banks.</p> <p>Describe aspiration, sedimentation and isolation modes of samples collection. Give examples.</p> <p>What are total parameters. What are advantages of their application. Give examples.</p> <p>Ways of total hydrocarbons parameter determination in air samples.</p> <p>What is the principle of SYMBIO system operations?</p> <p>Pros and cons of SF<sub>6</sub> application as environmental tracer.</p> <p>Principle of emission measurement by environmental tracing method.</p> <p>Application of environmental tracers. Describe areas of application.</p> <p>What compounds are applied as environmental tracers? Give examples.</p> <p>Features of ideal environmental tracer.</p> <p>Explain terms: bioavailability, bioaccumulation, bioconcentration, biomagnification and biotransformation.</p> <p>What are the features of organism to be used in BEWS?</p> <p>Why toxicological tests should be introduced to environmental monitoring? What are the limitations of chemical monitoring?</p> <p>What is derivatization and what is its purpose?</p> <p>Factors influencing concentration of radon in habituated buildings.</p> <p>Describe SPME extraction.</p> <p>Factors influencing SPME extraction efficiency.</p> <p>Discuss stationary phases applied in SPME fibres. Discuss SPME sorbent selection process.</p>
Work placement	Not applicable