



## Subject card

Subject name and code	Microscopy in Environmental Monitoring, PG_00042396						
Field of study	Green Technologies						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2023/2024		
Education level	second-cycle 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	1	Language of instruction			Polish		
Semester of study	2	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			assessment		
Conducting unit	Department of Polymers Technology -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Justyna Kucińska-Lipka					
	Teachers						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	30.0	0.0	0.0	45
	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	45	5.0		25.0	75	
Subject objectives	To acquaint students with the basics and methods of microscopic research used in the assessment of the quality of the broadly understood environment.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_W03] will have a detailed knowledge of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants and the technology of cleaning and neutralization of industrial waste and wastewater management and the design and supervision of environmentally friendly technologies	The student knows how to operate various types of microscopes used in environmental monitoring and is able to prepare a microscopic research plan to determine and monitor the type of environmental pollution in terms of environmentally friendly technologies.			[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge		
	[K7_U01] able to obtain information from literature, databases and other sources, can integrate the information obtained, to make their interpretation and critical evaluation, as well as draw conclusions and formulate and fully justify opinions, able to prepare a study in Polish and short scientific report in a foreign language on the results of their own research	The student is able to propose and justify the use of appropriate microscopic examination methods related to the monitoring of the quality of the external environment and at workplaces.			[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools		
[K7_K01] is ready to solve the most common problems associated with the profession of engineer, correctly identifies and resolves dilemmas associated with the profession of engineer, assesses risks and is able to assess the effects of the activity	The student has knowledge of how to obtain data on the environmental quality methods using various microscopic tools and draw conclusions about the quality of the environment based on the results of microscopic examinations.			[SK5] Assessment of ability to solve problems that arise in practice			

Subject contents	Introduction to optical and electron microscopy. Types of air pollutants and PM2.5, 5 and 10 particulate monitoring - preparation of test preparations and analysis of microscopic observation results (dust of various origins, including asbestos). The use of diatom classification analysis on the basis of microscopic examination to assess the quality of various water bodies (lakes, rivers, oceans, etc.). Microscopic examination of soil and assessment of its quality. Preparation and microscopic analysis of biological samples. Basics of environmental monitoring with the use of polarization, confocal and atomic force microscopy.		
Prerequisites and co-requisites	The fundamental knowledge in physics and chemistry.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory	60.0%	40.0%
	written and oral egzam	60.0%	60.0%
Recommended reading	Basic literature	Atomic force microscopy / Peter Eaton, Paul West.Eaton, Peter Jonathan. Oxford : Oxford University Press, 2011.Repr.VIII, 248 s., [4] s. tabl. : il. (w tym kolor.) ; 26 c	
		Principles and techniques of elektron microscopy : biological applications. Vol. 1 / M. Arif Hayat.	
		Hayat, M. Arif (1936- ). New York [etc.] : Van Nostrand Reinhold Company, cop. 1970. XV, 412 s. : il. ; 24 cm.	
	Supplementary literature	<a href="#">Atomic force microscopy / Peter Eaton, Paul West. Eaton, Peter Jonathan.</a> Adres wydawniczy <a href="#">Oxford : Oxford University Press, 2011.</a> Wydanie Repr.Opis fizyczny VIII, 248 s., [4] s. tabl. : il. (w tym kolor.) ; 26 cm	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	Asbestos microscopy. Dust electronography and dentification. - lab		
	Microscopic analysis of emulsions in oily sewage - lab.		
	Detection of microplastics in soil.		
Work placement	Not applicable		