

Subject card

Subject name and code	Technology of soil remediation, PG_00117763						
Field of study	Chemistry						
Date of commencement of studies	October 2025		Academic year of realisation of subject			2025/2026	
Education level	Master's studies		Subject group			Obligatory subject group in the field of study 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			1.0	
Learning profile	academic		Assessment form			credit	
Conducting unit	Laboratory of Photocatalysis -> Department of Environmental Technology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. inż. Ewelina Grabowska-Musiał				
	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	Familiarizing students with all issues mentioned in the lecture program content. To familiarize students with the main stages of the technological process used to remediate contaminated soils. To familiarize students with instrumental analysis techniques. Developing the ability to independently perform calculations necessary for the correct interpretation of analysis results Developing the ability to independently select the appropriate remediation technique for a given purpose.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[CHEMMU2_U01] Plans and implements chemical experiments of medium complexity.	He talks about technology issues environmental remediation in understandable language, using correct nomenclature	[SU1] oral statement/conversation/discussion [SU5] implementation of a problem task
	[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	can independently search for additional literature and read it basis to deepen knowledge	[SK5] implementation of a problem task
	[CHEMMU2_W12] Knows the principles of occupational health and safety to the extent that allows independent work on a research and/or measurement position.	applies safety rules at work	[SW5] implementation of a problem task
	[CHEMMU2_K03] Understands the need for systematic work on various projects of a long-term nature and knows how to set priorities for the implementation of undertaken tasks.	Plans and develops technologies remediation of contaminated land	[SK5] implementation of a problem task [SK8] observation of student's independent or team work
	[CHEMMU2_W02] Has extended and in-depth knowledge in the field of basic chemistry.	He talks about environmental remediation technology issues in understandable language, using correct nomenclature	[SW1] oral statement/conversation/discussion [SW5] implementation of a problem task
	[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	Evaluates selected properties contaminated soil and assesses the effectiveness of remediation of contaminated soils (bioremediation method and washing)	[SW4] test/exam - oral or written [SW1] oral statement/conversation/discussion
Subject contents	Sources and types of pollution. Characteristics of pollutants: pesticides and petroleum substances, heavy metals and radionuclides. Soil characteristics. Types of soil sorption. Spread of harmful substances in the environment. Characteristics of groundwater. The fate of pollutants in water and soil (chemical, biochemical and photochemical processes). The impact of pollutants on the physical and mechanical properties of soil. Soil reclamation - definitions and basic tasks of the process. Division of soil remediation methods. Physico-chemical methods of soil reclamation. Biological methods of soil reclamation. Thermal methods of soil reclamation. Stabilization and solidification In-situ and ex-situ groundwater purification methods. Methods of sealing waste landfills and types of insulating layers.		
Prerequisites and co-requisites	General chemistry, organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry. Knowledge of the basics of general chemistry, organic chemistry and physical chemistry, as well as knowledge of the basics of methods chemical analysis.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exam	51.0%	100.0%
Recommended reading	Basic literature	Kowalik P., Ochrona środowiska glebowego, PWN, Warszawa, 2001. Zadroga B., Olańczuk-Neyman K., Ochrona i rekultywacja podłoża gruntowego, Wydawnictwo Politechniki Gdańskiej, 2001. Greinert H., Ochrona gleb, Wydawnictwo Politechniki Zielonogórskiej, Zielona Góra, 1998. Gworek B (red), Technologie rekultywacji gleb, Wydawnictwo Naukowe Gabriel Borowski, Warszawa 2004	
	Supplementary literature	Szyk J., Ocieki ze składowisk odpadów komunalnych, Wydawnictwo Naukowe Gabriel Borowski, Warszawa 2003 Olszanowski A. (red.), Remediacja i bioremediacja zanieczyszczonych wód i gruntów oraz wykorzystanie modelowania i technik informatycznych w inżynierii, Wydawnictwo Politechniki Poznańskiej, 2001	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Discuss the procedure for determining the scope of recultivation of contaminated landExplain the following terms: (a) aeration zone, (b) saturation zone; (c) rhizosphere List and discuss in detail the strategies used and specific examples of soil remediation technologies using thermal methods used in ex-situ conditions Draw a diagram of the installation and, based on the drawing, discuss soil treatment using the in-situ aeration method Discuss the mechanisms of removing contaminants in the phytoextraction process Discuss the advantages and disadvantages of solidification/stabilization of contaminated soils (both in-situ and ex-situ) List and discuss the properties of soil and pollutants that influence the choice of recultivation technology. Graphically present a diagram of the procedure for determining the scope of recultivation Discuss the degrees of degradation of the soil environment. Characterize groundwater. Explain the concepts: saturation zone and areation zone. Draw a diagram of the installation and, based on the drawings, discuss any soil treatment method implemented in-situ. Draw a diagram of the installation, discuss the types of solutions used depending on the contaminants removed in the chemical extraction/washing process used for soil purification carried out under ex-situ conditions Discuss the advantages and disadvantages of solidification/stabilization of contaminated soils (both in-situ and ex-situ)		
Work placement	Not applicable		