



## Subject card

Subject name and code	Groundwater and Soil Protection, PG_00059995						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2024		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		English		
Semester of study	1		ECTS credits		5.0		
Learning profile	general academic profile		Assessment form		assessment		
Conducting unit	Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor		prof. dr hab. inż. Adam Szymkiewicz				
	Teachers		prof. dr hab. inż. Adam Szymkiewicz  dr inż. Jolanta Lewandowska  dr inż. Anna Gumuła-Kawęcka				
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	30.0	0.0	0.0	0.0	60
	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	60		5.0		62.0	127
Subject objectives	To familiarize students with the main sources of contaminants in soil-groundwater environment, mechanisms of contaminant transport, methods of soil and groundwater protection and clean-up						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[K7_W11] has knowledge to analyze, evaluate and optimize processes, objects and systems of environmental engineering and knows the principles of rational energy management and resources		student knows the principles of rational and sustainable management of groundwater resources		[SW2] Assessment of knowledge contained in presentation		
	[K7_U08] is able to assess risks in the implementation of engineering projects and implement appropriate safety rules		student is able to identify the threats to quality and quantity of groundwater resources, related to engineering activity		[SU2] Assessment of ability to analyse information		
	K7_U10		student is able to design elements of soil and groundwater remediation systems		[SU4] Assessment of ability to use methods and tools		
	K7_U12		student is able to evaluate usefulness of selected systems for protection and remediation of soil and groundwater		[SU4] Assessment of ability to use methods and tools		
	K7_W09		student has in-depth knowledge about groundwater hydrology as well as protection and management of groundwater resources		[SW2] Assessment of knowledge contained in presentation		
Subject contents	Flow in unsaturated and saturated zone, types of contaminants and their sources, mechanisms of contaminant transport, methods of groundwater protection, methods of soil and groundwater remediation						
Prerequisites and co-requisites	Basic knowledge of hydrology, geology and chemistry						

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	exercises: individual or group assignments	50.0%	100.0%
	lecture: attendance	80.0%	0.0%
Recommended reading	Basic literature	Bhandari, Alok Surampalli, Rao Y. Champagne, Pascale Ong, Say Kee Tyagi, R. D. Lo, Irene M. C.. (2007). Remediation Technologies for Soils and Groundwater. American Society of Civil Engineers (ASCE). Retrieved from <a href="https://app.knovel.com/hotlink/toc/id:kpRTSG0007/remediation-technologies/remediation-technologies">https://app.knovel.com/hotlink/toc/id:kpRTSG0007/remediation-technologies/remediation-technologies</a>  Domenico, Patrick A. Schwartz, Franklin W.. (1998). Physical and Chemical Hydrogeology (2nd Edition). John Wiley & Sons. Retrieved from <a href="https://app.knovel.com/hotlink/toc/id:kpPCHE0002/physical-chemical-hydrogeology/physical-chemical-hydrogeology">https://app.knovel.com/hotlink/toc/id:kpPCHE0002/physical-chemical-hydrogeology/physical-chemical-hydrogeology</a>	
	Supplementary literature	<a href="https://www.itrcweb.org/Guidance">https://www.itrcweb.org/Guidance</a>	
	eResources addresses	Adresy na platformie eNauczanie:	
	Example issues/ example questions/ tasks being completed	distribution of organic contaminants between solid, liquid and gas phases, determination of well capture zone, solution of 1D advection-diffusion equation	
Work placement	Not applicable		

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