

**Subject card**

<b>Subject name and code</b>	Underground waters protection - laboratory classes, PG_00193040						
<b>Field of study</b>	Geology						
<b>Date of commencement of studies</b>	October 2026	<b>Academic year of realisation of subject</b>			2028/2029		
<b>Education level</b>	Bachelor's studies	<b>Subject group</b>			Obligatory subject group in the field of study Subject group related to scientific research in the field of study		
<b>Mode of study</b>	full-time studies	<b>Mode of delivery</b>			at the university		
<b>Year of study</b>	3	<b>Language of instruction</b>			Polish		
<b>Semester of study</b>	5	<b>ECTS credits</b>			1.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			credit		
<b>Conducting unit</b>	Department of Geophysics -> Faculty of Oceanography and Geography -> Rector						
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>		dr Izabela Chlost				
	<b>Teachers</b>						
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	0.0	0.0	15.0	0.0	0.0	15
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	<b>Learning activity</b>	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	<b>Number of study hours</b>	15		1.0		9.0	25
<b>Subject objectives</b>	Making analyses of migration of pollutants, designation of a protection zone for water intakes.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[GEOLL3_U01] is able to apply basic measurement and analytical techniques in the field and in the laboratory, plans to conduct research and measurements	Is able to apply basic measuring and analytical techniques in the field and laboratory, and to plan investigations and measurements in the field of groundwater protection	[SU3] text preparation/written work
	[GEOLL3_U02] has the skill of analytical and synthetic way of reasoning leading to correct inference based on the results obtained or the facts presented	Has the ability to reason analytically and synthetically, leading to correct conclusions based on the results obtained or facts presented in terms of groundwater protection	[SU3] text preparation/written work
	[GEOLL3_W02] knows and understands the terminology appropriate in science and natural sciences	Knows and understands groundwater-specific terminology	[SW3] text preparation/written work
	[GEOLL3_W05] knows the structure and geological development of selected regions in Poland and in the world	Knows the structure and geological development of selected regions in Poland and the world in relation to groundwater protection	[SW3] text preparation/written work
	[GEOLL3_U06] is able to identify geological objects and combine them with geological processes and anthropogenic environmental transformations	Is able to identify geological objects and link them to hydrogeological processes and anthropogenic transformations of the groundwater environment	[SU3] text preparation/written work
[GEOLL3_W07] knows the anthropogenic transformation of the natural environment, including the effects of the exploitation of mineral resources	Is familiar with anthropogenic transformation of the natural environment, including the effects of groundwater exploitation	[SW3] text preparation/written work	
Subject contents	Calculation of vertical migration of pollutants in the aeration zone. Delineation by graphic method of the indirect protection zone of a typical groundwater intake. Give a presentation on a selected issue or example of threat and protection of groundwater from pollution.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	credit work	51.0%	100.0%
Recommended reading	Basic literature	Chełmicki W.; 1997, 1999 Deja i wód. Cz. 1, Jakość. Cz.2 Zasoby: Instytut Geografii UJ, Kraków . Chełmicki W., 2002. Woda. Zasoby, degradacja, ochrona, Wyd. Naukowe PWN, Warszawa Kleczkowski S. [et al.]; 1994: Metodyczne podstawy ochrony wód podziemnych. AGH. Kraków Macioszczyk A., Dobrzyński, 2003. Hydrogeochemia wód podziemnych strefy aktywnej wymiany, Wyd. Naukowe PWN, Warszawa Paczyński B, Sadurski A. (red.), 2007. Hydrogeologia regionalna Polski, PIG, Warszawa Pazdro Z., Kozerski B., 1989. Hydrogeologia ogólna, Wyd. Geologiczne, Warszawa Piekarek-Jankowska H., 1994. Zatoka Pucka jako obszar drenażu wód podziemnych, Wyd. Uniwersytetu Gdańskiego	
	Supplementary literature	Kleczkowski, A. S., (red.), 1984. Ochrona wód podziemnych, Wyd. Geologiczne, Warszawa Kozerski B.(red), 2007. Gdański system wodonośny, Wyd. Politechniki Gdańskiej, Gdańsk Macioszyk A., 1987. Hydrogeochemia, Wyd. Geologiczne, Warszawa Pleczyński J., 1981. Odnawialność zasobów wód podziemnych, Wyd. Geologiczne, Warszawa Kleczkowski A., Różkowski A., 1997. Słownik hydrogeologiczny, Wydawnictwo TRIO Ustawa, Prawo wodne. z dnia 18 lipca 2001 r. (Dz. U. 2001.115.1229)	
	eResources addresses		
Example issues/example questions/tasks being completed	Calculation of vertical migration of pollutants in the aeration zone.		
Work placement	Not applicable		

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