GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00059979		
Field of study	Environmental Engineering		
Date of commencement of studies	February 2024	Academic year of realisation of subject	2024/2025
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	2.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. inż. Rafał Bray	
	Teachers	dr hab. inż. Rafał Bray dr hab. inż. Beata Jaworska-Szulc	

Lesson types and methods of instruction

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	15.0	0.0	0.0	0.0	30

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	30	5.0	20.0	55

Subject objectives

Familiarization with individual processes used in water renewal. Developing the ability to select technological concepts and evaluate the technological solutions used.To familiarize students with issues related to water resources on Earth and the availability and use of resources in Poland. To familiarize students with methods of calculating groundwater resources and determining protection zones.

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	The student has the knowledge to analyze, evaluate and optimize processes, facilities and systems used in water renewal and knows the principles of rational resource management.	[SW1] Assessment of factual knowledge
K7_U04	The student is able to prepare and present a presentation and a design task, as well as lead a discussion regarding the presentation and the design task.	[SU5] Assessment of ability to present the results of task [SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
K7_W07	The student has in-depth, structured, theoretically based knowledge of water resources, water renewal, methods of removing various pollutants from water, individual processes and factors influencing their course.	[SW1] Assessment of factual knowledge

Subject contents	Water resources: Water resources in the world, in Europe and in Poland, the degree of resource use and the impact of climate change on their depletion. Groundwater resources in Poland: main aquifers and associated resources of ordinary groundwater. Geothermal water resources in Poland. Classification of resources: static and dynamic resources, available and prospective resources, and operational resources. Methods for determining water resources, hydrogeological models as a basis for determining groundwater resources. Isotope research in the assessment of water resources. Water threats and protection. Main Ground Water Reservoirs (GZWP) and their protection. Classifications of bottled water: mineral and medicinal.Exercises:: Student presentation on bottled water: mineral, spring, table and medicinal waterWater renewal. Lecture: The concept of water renewal and its importance in the water management of a country, region and city. Goals and possibilities of water renewal. Characteristics of biologically treated sewage. Required water quality parameters after the renewal process. Unit processes used in water renewal. Technological systems of water renewal stations. Basic processes in water renewal: coagulation with hydrolyzing salts, coagulation with lime, recarbonization, ammonia removal (nitrification, stripping, ion exchange, oxidation), ion exchange, membrane processes (microfiltration, ultrafiltration, nanofiltration, reverse osmosis), disinfection in water renewal. Devices in water renewal.Exercises: Design task - calculation of an ion exchanger
Prerequisites and co-requisites	Knowledge of geology, environmental protection, environmental chemistry, environmental microbiology and ecology, and water and wastewater technology.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Final colloquium on water renewal	60.0%	40.0%
Final colloquium on water resources	60.0%	40.0%
Presentation on water resources	60.0%	10.0%
Design task related to water renewal	60.0%	10.0%

Recommended reading

Basic literature

1. Kowal A. (red.): Water renewal. Theoretical foundations of processes. Wrocław: Ed. Wrocław University of Science and Technology.
2. Kowal A., Świderska-Bróż M.: Water purification. Warsaw: WN PWN.
3. Nawrocki J., Biłozor S.: Water purification. Chemical and biological processes. Warsaw: PWN 2000.
4. UN-Water and UNESCO, The United Nations World Water Development Report 2022 - Making the Invisible Visible
5. Jokiel 2004, Water resources of central Poland on the threshold of the 21st century. Ed. UŁ
6. Pergoł, Regulska 2021, Balance of exploitable groundwater resources in Poland, Warsaw, PIG PIB
7. E. Poeter, et al.. 2020 Groundwater in Our Water Cycle.The Groundwater project.
8. Zuber red., 2007, Tracer methods in hydrogeological research: methodological guide, Polit. Wr.

Supplementary literature

1. Dojlido J.: Water chemistry. Warsaw: Arkady.
2. Heidrich Z.: Water treatment devices. Design principles and calculation examples. Warsaw: Arkady.
3. M. Sozański, P.M. Huck.: Experimental research in the development of water treatment technologies. Monographs PAN, vol.42, Lublin 2007.
4. A. Bauer, G. Dietze, W. Muller, K. J. Soine, D. Weideling.: Water supply system operator's guide. Ed.Seidel-Przywecki, Warsaw 2005.
5. Z. Heidrich.: Waterworks and sewerage part 1. Waterworks. Ed. School and Pedagogical, Warsaw 1992.
6. Healy R.W, 2010, Estimating groundwater recharge. Cambridge University Press.
7. Pergoł, Regulska 2021, Balance of exploitable groundwater resources in Poland, Warsaw, PIG PIB
8. Macioszczyk A., Dobrzyński D., 2007 Hydrogeochemistry, PWN
9. Diamond R.E., 2022, Stable Isotope Hydrology. The Groundwater project.

eResources addresses

Adresy na platformie eNauczanie:

Example issues/ example questions/ tasks being completed

1. Select (from the list) and arrange in order the processes using coagulation with lime (or hydrolyzing salts). Mark with an arrow the place where CaO (or coagulant) is dosed.
2. What is the purpose of the recarbonization process after coagulation with lime?
3. Which ions can be removed with sodium cation exchanger?
4. Name pressure membrane processes.
5. Characterize the microfiltration process (or ultrafiltration, nanofiltration, reverse osmosis).

Work placement: Not applicable

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