



Subject card

Subject name and code	Water Technology , PG_00058792						
Field of study	Environmental Engineering						
Date of commencement of studies	October 2022	Academic year of realisation of subject			2023/2024		
Education level	first-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	2	Language of instruction			Polish		
Semester of study	4	ECTS credits			3.0		
Learning profile	general academic profile	Assessment form			exam		
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 inż. Aleksandra Sokołowska dr hab. inż. Rafał Bray					
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		31.0	81
Subject objectives	Student will acquire the necessary knowledge on issues related to the implementation of unit processes used in water treatment plants.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_U09] is able to use well-chosen methods and measuring devices that enable determination of basic parameters of the water treatment process and wastewater treatment; can perform simple laboratory tests leading to the assessment of water quality, pollutant load in sewage	The student is able to use properly selected methods and measuring devices to determine the basic parameters of the water treatment process; can perform simple laboratory tests leading to water quality assessment.	[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
	[K6_U01] has the ability to self-education, can obtain information from literature, databases and other sources, uses information technology, Internet resources; can integrate the obtained information, make their interpretation, as well as draw conclusions and formulate and justify opinions	The student has the ability to self-study, is able to obtain information from literature, databases and other sources, uses information technologies, Internet resources; is able to integrate the obtained information, interpret it, as well as draw conclusions and formulate and justify opinions.	[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
	[K6_U10] can design basic equipment for water treatment, wastewater treatment and sludge and waste management	The student is able to design basic water treatment devices.	[SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information
[K6_W03] has a structured and theoretically founded knowledge in the field of chemistry and biology, including knowledge necessary to understand the technological processes related to water treatment, wastewater treatment, waste management and sludge management	The student has structured and theoretically founded knowledge in the field of chemistry and biology, including the knowledge necessary to understand the technological processes related to water treatment.	[SW2] Assessment of knowledge contained in presentation [SW1] Assessment of factual knowledge	
Subject contents	<p>Lectures: Water in nature and its physical and chemical characteristics. The quality of groundwater and surface water. The requirements concerning the quality of drinking water and industrial water. The removal of admixtures and contaminants forming heterogeneous bodies. Water clarification and sedimentation. The coagulation of water contaminants. Coagulants, flocculants and substances supporting the coagulation. The factor limiting coagulations. Volumetric coagulation. Surface coagulation. Contact coagulation in suspended precipitate. Water filtration. Pressure and gravity filter. Organic mikrocontaminants removal in sorption processes. Water disinfection. Physical methods of disinfection. Chemical oxidizing substances in water disinfection: chlorine, dioxide chlorine, ozone. The removal of admixtures and contaminants forming homogeneous bodies. Iron compounds removal. Manganese compounds removal. Ammonia removal. The equipment applied to the iron and manganese removal from water. Ion exchange processes, the types of ion exchange. Removing of carbonate hardness and demineralization of water in ion exchanging processes. Basics of membrane techniques. Water degasification. Water stabilization.</p> <p>Laboratories: The introduction to the laboratory classes. Physical-chemical determination of selected contaminants of natural waters. Ion exchange. Coagulation. Removal of iron in water. The revision. Test. Membrane processes.</p>		
Prerequisites and co-requisites	Completed subjects: Fundamentals of chemistry in environmental engineering I (PG_00058739); Fundamentals of chemistry in environmental engineering II (PG_00058749)		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Practical exercise	60.0%	35.0%
	Written exam	60.0%	65.0%
Recommended reading	Basic literature	<p>[1] Heidrich Z.: Urządzenia w uzdatnianiu wody. Warszawa: Arkady 1987.</p> <p>[2] Kowal A. L., Świdorska-Bróz M.: Oczyszczanie wody. Warszawa: PWN 2008.</p> <p>[3] Obarska-Pempkowiak H.: Technologia Wody. Gdańsk: Wyd. Politechniki Gdańskiej 1997.</p> <p>[4] Nawrocki J., Biłozor S.: Uzdatnianie wody. Procesy chemiczne i biologiczne. Warszawa: PWN 2000.</p>	

	Supplementary literature	<p>[1] Magrel L.: Uzdatnianie wody i oczyszczanie ścieków. Białystok: Wyd. Ekonomia i Środowisko 2000.</p> <p>[2] M. Sozański, P.M. Huck.: Badania doświadczalne w rozwoju technologii uzdatniania wody. Monografie PAN, vol.42, Lublin 2007.</p> <p>[3] A. Bauer, G. Dietze, W. Muller, K. J. Soine, D. Weideling.: Poradnik eksploatatora systemów zaopatrzenia w wodę. Wyd. Seidel-Przywecki, Warszawa 2005.</p>
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>Technologia wody - stacjonarne - lato 2023/2024 - Moodle ID: 38730 https://enauczenie.pg.edu.pl/moodle/course/view.php?id=38730</p>
Example issues/ example questions/ tasks being completed	<ul style="list-style-type: none"> • List the most common surface and groundwater contaminants. • List the most commonly used processes in water clarification. (or decolorization, removal of dissolved organic substances, iron removal, manganese removal, ammonia removal, water softening, disinfection). • What is water aeration used for? (or coagulation, sedimentation, filtration, ion exchange, disinfection). • Propose, in the form of a block diagram, a technological line for surface water treatment. • Propose, in the form of a block diagram, a technological line for the treatment of groundwater containing elevated concentrations of iron (or manganese). • List the types (methods) of coagulation. • Indicate the place of disinfection (and oxidation) in water treatment systems. • List the physical (or chemical) water disinfection methods used in water technology. • Select factors influencing the coagulation (or iron removal, manganese removal) process. 	
Work placement	Not applicable	