

Subject card

Subject name and code	Unit processes in environmental engineering, PG_00103634						
Field of study	Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2026/2027		
Education level	Master's 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	academic		Assessment form		exam		
Conducting unit	Laboratory of Photocatalysis -> Department of Environmental Technology -> Faculty of Chemistry -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Emilia Gontarek-Castro				
	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		33.0	50
Subject objectives	familiarizing students with the principles of preparing a process flow chart familiarizing students with technological principles familiarizing students with basic unit processes and operations used in environmental protection technologies familiarizing students with the practical applications of the discussed unit processes and operations						
Learning outcomes	Course outcome		Subject outcome		Method of verification		
	[OŚMU2_U01] On the basis of the acquired knowledge, proposes to solve environmental problems.		Knows environmental protection problems and applies learned individual actions to counteract these problems.		[SU4] test/exam - oral or written		
	[OŚMU2_W08] Explains the mechanisms of unit processes used in environmental protection and waste management methods.		Distinguishes and discusses unit operations and processes used in environmental engineering.		[SW4] test/exam - oral or written		
	[OŚMU2_W01] Describes complex phenomena and processes occurring in nature, including those related to the spread of anthropogenic pollution.		Explains the processes that occur in various environmental components when pollutants are introduced into them.		[SW4] test/exam - oral or written		

Subject contents	The concept of a unit operation and process, process flow charts and technological principles, mass and energy balance of the process. Detailed discussion of such unit processes as: chlorination, ozonation, advanced oxidation methods (Fenton's method, advanced oxidation in sub- and supercritical water, photochemical and electrochemical methods), ion exchange, biochemical processes (aerobic and anaerobic, nitrification, denitrification and others). Understanding the mechanism and the influence of operating parameters on the effectiveness of selected unit processes. Detailed discussion of membrane processes and their application in environmental engineering.		
Prerequisites and co-requisites	knowledge of basic methods and equipment for water treatment, sewage treatment, basic laboratory work and 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	1. J. Szarawara, J. Piotrowski, Podstawy teoretyczne technologii chemicznej, WNT, Warszawa, 2010 2. Anielak A. M., Wysokoefektywne metody oczyszczania. PWN Warszawa 2015. 3. Nawrocki J., Uzdatnianie wody. Część 2. PWN, Warszawa, 2010.	
	Supplementary literature	1. Łomotowski J., Szpindor A., 1999. Nowoczesne systemy oczyszczania ścieków. Arkady. Warszawa 2. Bodzek M., Bohdziewicz J., Membrany w biotechnologii, Politechnika Śląska, 1993. 3. Janosz-Rajczyk M., Wybrane procesy jednostkowe w inżynierii środowiska, Wyd. Pol. Częstochowskiej, Częstochowa 2004 4. Warych J, Oczyszczanie przemysłowych gazów odlotowych, WNT W-wa 1994. 5. Maćkiewicz J., Flokulacja w procesach koagulacji i filtracji wód, PWN, W-wa, 1987.	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Open questions:1. Choose one of the technological principles and describe what it concerns. Based on appropriate examples from industry/laboratory practice, explain how to proceed to apply it.2. List what can be the driving force of membrane processes and provide an example of a membrane process for each driving force.3. Describe the ion exchange/chlorination/ozonation process4. Draw a flow chart of the preparation of ... according to the description of the synthesis ...Closed questions:1. Can nanofiltration be used for complete desalination of water? YES/NO2. Is leaching a process or a single operation? PROCESS/ OPERATION3. Hypochlorous ion has much worse bactericidal properties than chloric acid (I). YES/NO4. The spiral membrane module is characterized by a very high cost of production. YES/NO5. This method of producing porous membranes allows for obtaining uniform and cylindrical pores: phase inversion/sintering/ stretching/etching paths/leaching		
Work placement	Not applicable		

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