University of Gdańsk

Subject card

Subject name and code	Unit processes in environmental engineering, PG_00103634						
Field of study	Environmental Protection						
Date of commencement of studies	October 2024		Academic year of realisation of subject	2024/2025			
Education level	postgraduate studies		Subject group	Obligatory subject group 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				
Conducting unit	Pracownia Fotokatalizy -> Katedra Technologii Środowiska -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr 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						
	Additional information: Lecture with multimedia presentation						

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_K04] Leads the group and bears responsibility for it.	Knows the principles of safe work in the laboratory and is able to manage laboratory work carried out by a group of students.	[SK8] observation of student's independent or team work
[OŚMU2_W09] Applies safety and hygiene principles when working independently on a test or measurement stand in a laboratory or in the field.	Independently plans and coordinates experimental work.	[SW5] implementation of a problem task
[OŚMU2_K02] Recognises threats, creates safe work conditions and is responsible for the safety of own and other people's work.	Based on the occupational health and safety regulations learned during his/her studies, he/she controls their compliance at the workplace.	[SK8] observation of student's independent or team work
[OŚMU2_U02] Uses advanced measurement and analytical techniques used in environmental protection.	Is able to propose and use appropriate analytical and measurement techniques to assess the quality of the natural environment.	[SU4] 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
[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_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

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	Adresy na platformie eNauczanie:

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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