GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Wastewater treatment and disposal of sewage sludge, PG_00065970		
Field of study	Green Technologies		
Date of commencement of studies	February 2025	Academic year of realisation of subject	2025/2026
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	Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ilona Kłosowska-Chomiczewska	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	15.0	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	15.0	50

Subject objectives

The aim of the course is to learn the characteristics of different types of wastewater depending on their origin (industrial sector) as well as introduce the commonly used technologies for removing pollutants from wastewater and get to know an alternative methods. Another goal is to understand the problems of management of sewage sludge generated in municipal wastewater treatment plants and industrial plants.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] defines the principles of sustainable development, national and European conditions for environmental management, in the field of intellectual property protection and patent law	The student defines technologies used in wastewater treatment, recognizes appropriate technological solutions, assesses risk, and predicts the consequences of implemented actions.	[SW1] Assessment of factual knowledge
[K7_U04] is able to design and supervise environmentally friendly technologies, waste-free technologies, and also perform expert opinions on the environmental impact of technologies already in use	The student defines technologies used in wastewater treatment, recognizes appropriate technological solutions, assesses risk, and predicts the consequences of undertaken actions.	[SU2] Assessment of ability to analyse information
[K7_K04] is aware of the responsibility for decisions made, observing and developing the principles of professional ethics and working to ensure compliance with these principles	The student is aware of the social and environmental responsibility associated with the design, modification, and operation of wastewater treatment technologies and sewage sludge management processes; understands the importance of reliable selection of methods, techniques, and measurement equipment for ensuring process safety and environmental protection; and demonstrates readiness to comply with principles of professional ethics and sustainable development in engineering practice.	[SK2] Assessment of progress of work

<table>
<tr><td>Subject contents</td><td>Course content – lecture
Characteristics of municipal and industrial wastewater depending on the origin. Wastewater treatment: basic physical and physicochemical processes (sedimentation, flotation, extraction, coagulation, adsorption, dialysis, reverse osmosis, ion exchange), chemical processes (neutralization, precipitation, chlorination, reduction, oxidation), and biological processes (aerobic biodegradation, acid fermentation, methane fermentation). Modern solutions for industrial waste treatment and biological removal of biogenic impurities. Selection of wastewater treatment technology for selected examples of wastewater from food, chemical and engineering industry. Characteristics and treatment of leachate from municipal landfills and wastewater resulting from the remediation of oily soil. Characteristics of the sludge from different stages of sewage treatment (grit and sludge from primary settling tanks, excessive biological sludge). Sewage sludge processing technologies: methods for thickening and dewatering of sewage sludge (lagoons, reed beds, belt-filter presses, conditioning by polyelectrolytes), biological, thermal and chemical stabilization (mechanism and technology). Autothermal, thermophilic, aerobic sludge hygienisation. Sanitation and fermentation of sewage sludge. Thermal processing for sewage sludge management, combustion. Requirements for the safe storage of sewage sludge. Fertilizing properties of sludge from municipal sewage treatment plants and their processing into mineral-organic fertilizer. Agriculture utilization of sewage sludge (composting, reed beds, vermicultures). Use of sewage for remediation of degraded areas and industrial waste disposal (eg. lime after flotation). The recovery of phosphorus from sewage sludge. The most common problems associated with wastewater treatment and serious failures.

Course content – laboratory
The laboratory includes the practical operation of anaerobic digestion of sludge and the analysis of its outcomes. Students carry out experiments on mechanical and biological wastewater treatment, gaining insight into the performance of individual process stages. The classes involve measurements of basic parameters of wastewater and sludge. The laboratory also covers sludge thickening and dewatering processes. Emphasis is placed on result interpretation and the evaluation of technological process efficiency.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td></td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>exam</td><td>60.0%</td><td>60.0%</td></tr>
<tr><td>laboratory tests and reports</td><td>60.0%</td><td>40.0%</td></tr>
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<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>1. Metcalf & Eddy, et al. Wastewater engineering: treatment and reuse. McGraw Hill, 2003.

2. Obarska-Pempkowiak, Hanna, Magdalena Gajewska, and Ewa Wojciechowska. Hydrofitowe oczyszczanie wód i ścieków. Wydawnictwo Naukowe PWN, 2010.</td></tr>
<tr><td>Supplementary literature</td><td>Kowal, Apolinary Leszek, and Maria Świderska-Bróż. Oczyszczanie wody: podstawy teoretyczne i technologiczne, procesy i urządzenia. Wydawnictwo Naukowe PWN, 2007.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>What is the principal of biological nitrogen removal from wastewater. Transformation of nitrogen compounds - reactions.
Characterize the wastewaters from the selected industries (petrochemical, galvanization, food etc.) and prepare a technological scheme of sewage treatment. What types of contaminants are removed at various stages?
What are the principals of wastewater treatment in case of sewage containing emulsified oils?
What is the purpose and what are the parameters of the thermal sewage sludge treatment?
What is the purpose of sludge conditioning and what methods are designed for this?</td></tr>
<tr><td>Practical activites within the subject</td><td>Not applicable</td></tr>
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