GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Pollution of water resources and methods of their prevention, PG_00057717		
Field of study	Green Technologies		
Date of commencement of studies	October 2022	Academic year of realisation of subject	2024/2025
Education level	first-cycle studies	Subject group	Optional subject group 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	3	Language of instruction	Polish
Semester of study	6	ECTS credits	6.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Process Engineering and Chemical Technology -> Faculty of Chemistry		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Anna Zielińska-Jurek	
	Teachers	dr inż. Anna Grzegórska prof. dr hab. inż. Anna Zielińska-Jurek	

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	15.0	0.0	60
	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	60	5.0	85.0	150

Subject objectives	
	According to the World Health Organization, one of the main goals of sustainable development is to ensure access to drinking water in the place of residence. Currently, 3 out of 10 people worldwide, a total of 2.1 billion people do not have access to clean drinking water, this problem also affects 100 million inhabitants of Europe. Therefore, the challenge of modern times is the effective protection of aquatic ecosystems, to maintain their good condition and reduce the negative impact on human and animal health. During the lectures, selected issues of modern chemical technology will be discussed - modern technologies of wastewater treatment, water recovery. As part of the course, the student will gain knowledge, skills and competences in the field of activities to improve the quality and protection of water against micropollutants, the functioning of the closed-loop economy as a solution to selected environmental problems of the modern world (pollution and consumption of drinking water resources). At the same time, they will gain theoretical, technological and engineering knowledge of an interdisciplinary nature regarding the sustainable management of water resources, advanced and innovative technologies of wastewater treatment, water recovery and valuable raw materials from wastewater and sewage sludge.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W03] has a basic knowledge of soil, air and water pollutants, design and supervision of environmentally friendly technologies and technologies which do not produce waste, knows technology of cleaning and neutralization of industrial waste and wastewater management, has a basic understanding of the theoretical basis of methods and types of apparatus used in chemical analysis of environmental pollutants	The student has basic knowledge of pollutants present in water from surface and groundwater runoff and the methods and stages of water purification used in technology, as well as modern water purification methods constituting the so-called IV stage of purification.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
	[K6_U05] can formulate and solve engineering tasks analytical methods, simulation as well as experimental, able to apply knowledge of basic physics and mathematics to analyze the results of experiments, is able to analyze and assess existing technical solutions	The student knows and understands terms related to pollution and purification of water resources.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment
	[K6_K03] turns the attention to the prestige associated with the profession and professional solidarity properly understood, shows respect for others and concern for their welfare	The student understands the importance of basic processes and unit operations in environmental protection	[SK5] Assessment of ability to solve problems that arise in practice
	[K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions.	The student has knowledge provided during classes and from basic literature regarding threats resulting from the presence of environmental pollution of water resources, has knowledge of the principles of sustainable development and their implementation in water purification technology.	[SW3] Assessment of knowledge contained in written work and projects [SW2] Assessment of knowledge contained in presentation
Subject contents	1. Pollution of inland waters, seas and oceans. Sources and types of water pollution. Characteristics of pollution 2. Mechanical, biological and chemical treatment of municipal wastewater. Sewage sludge - management and disposal. 3. Protection of water resources against eutrophication and industrial pollution. New directions in the technology of biological treatment of municipal sewage. 4. Rational management of water resources and sewage management in the light of the closed-loop economy. System solutions in the scope of closing and integration of water circuits and recycling of technological waters in municipal systems and production processes. 5. Technologies of sewage treatment, recovery of water and valuable raw materials from sewage. 6. New wastewater Directive concerning the collection, treatment and discharge of municipal sewage. Fourth stage of municipal wastewater treatment 7. Photochemical transformations in water. Application of advanced oxidation methods in water and sewage treatment technology. 8. Photocatalytic oxidation processes in water and wastewater treatment		
Prerequisites and co-requisites	The student has basic knowledge of the basics of environmental protection.		

<table>
<tr><td>Assessment methods and criteria</td><td colspan="2"><table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>laboratory</td><td>50.0%</td><td>25.0%</td></tr>
<tr><td>project</td><td>60.0%</td><td>35.0%</td></tr>
<tr><td>lectures (exam)</td><td>60.0%</td><td>40.0%</td></tr>
</table></td></tr>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Water Law

scientific articles from journal databases</td></tr>
<tr><td>Supplementary literature</td><td>scientific articles from journal databases</td></tr>
<tr><td>eResources addresses</td><td>Adresy na platformie eNauczanie:
Zanieczyszczenia zasobów wodnych i metody ich zapobiegania - Moodle ID: 45691
https://enauczanie.pg.edu.pl/moodle/course/view.php?id=45691</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Application of advanced oxidation methods in wastewater technology

Propose and present (in the form of a schematic diagram of 4-6 unit operations) a method for treating wastewater containing heavy metals

Propose and present (in the form of a schematic diagram of 4-6 unit operations) a method for treating wastewater containing micropollutants, e.g. non-biodegradable pesticides

List and briefly describe the main technological indicators in wastewater treatment</td></tr>
<tr><td>Work placement</td><td colspan="2">Not applicable</td></tr>
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