



## Subject card

Subject name and code	Wastewater treatment and disposal of sewage sludge, PG_00043564						
Field of study	Green Technologies						
Date of commencement of studies	February 2023	Academic year of realisation of subject			2023/2024		
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	Department of Colloid and Lipid Science -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Ilona Kłosowska-Chomiczewska					
	Teachers						
Lesson types and methods of instruction	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		20.0	55
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_W02] a broader and deeper knowledge of the soil, air and water from pollution useful to formulate and solve complex tasks in the field of environmental technologies and modern analytical methods	the student has an extended and deepened knowledge of the technology of purification and neutralization of industrial waste as well as water and sewage management; can modify the existing and design new devices and technologies for wastewater treatment and sewage sludge management using appropriate methods, techniques and tools; can use properly selected methods and devices to measure the basic quantities characterizing technological processes and the state of the environment	[SW1] Assessment of factual knowledge
	[K7_W05] has an broader knowledge of the advanced concepts and problems of quality management, application of the principles of work organization and integrated management and the knowledge necessary to understand the social, economic, legal and other non-technical considerations engineering activities, knows the basic principles of health and safety in force in environmental	the student knows the applicable legal acts regarding wastewater treatment and sewage sludge management, has knowledge of the principles of occupational health and safety in wastewater treatment plants	[SW1] Assessment of factual knowledge
	[K7_W01] is ready to solve the most common problems associated with the profession of engineer, correctly identifies and resolves dilemmas associated with the profession of engineer, assesses risks and is able to assess the effects of the activity	the student defines the technologies used in wastewater treatment, knows and recognizes the appropriate technological solutions, is able to assess the risk and predict the effects of the activities performed	[SK2] Assessment of progress of work
Subject contents	<p>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). Electrochemical oxidation in wastewater treatment. 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.</p>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	laboratory tests and reports	60.0%	40.0%
	exam	60.0%	60.0%
Recommended reading	Basic literature	<p>1. Metcalf &amp; Eddy, et al. Wastewater engineering: treatment and reuse. McGraw Hill, 2003.</p> <p>2. Obarska-Pempkowiak, Hanna, Magdalena Gajewska, and Ewa Wojciechowska. Hydrofitowe oczyszczanie wód i ścieków. Wydawnictwo Naukowe PWN, 2010.</p>	
	Supplementary literature	<p>Kowal, Apolinary Leszek, and Maria Świdarska-Bróż. Oczyszczanie wody: podstawy teoretyczne i technologiczne, procesy i urządzenia. Wydawnictwo Naukowe PWN, 2007.</p>	

	eResources addresses	Adresy na platformie eNauczanie:
Example issues/ example questions/ tasks being completed	<p>What is the principal of biological nitrogen removal from wastewater. Transformation of nitrogen compounds - reactions.</p> <p>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?</p> <p>What are the principals of wastewater treatment in case of sewage containing emulsified oils?</p> <p>What is the purpose and what are the parameters of the thermal sewage sludge treatment?</p> <p>What is the purpose of sludge conditioning and what methods are designed for this?</p>	
Work placement	Not applicable	