

## GDAŃSK UNIVERSITY

## Subject card

Subject name and code	WASTEWATER ENGINEERING, PG_00060005								
Field of study	Environmental Engineering								
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			English			
Semester of study	2		ECTS credits			4.0			
Learning profile	general academic profile		Assessment form			exam			
Conducting unit	Faculty of Civil and Environmental Engineering								
Name and surname	Subject supervisor prof. dr hab. inż. Jacek Mąkinia								
of lecturer (lecturers)	Teachers								
Lesson types and methods	Lesson type	Lecture	Tutorial	Laboratory	Projec	t	Seminar	SUM	
of instruction	Number of study hours	30.0	15.0	0.0	15.0		0.0	60	
	E-learning hours inclu	uded: 0.0							
Learning activity and number of study hours	Learning activity	Participation in classes includ	n didactic ed in study	Participation in consultation hours		Self-study		SUM	
	Number of study hours	60		5.0		38.0		103	
Subject objectives	Students get acquainted with techniques for the estimation of wastewater flows, characterization of wastewater quality as well as fundamental understanding of principal unit operations and processes used for wastewater treatment, especially those processes used for biological nutrient removal and sludge handling. Each student prepares a preliminary design of an advanced wastewater treatment plant (ATV A131) and optimizes the design using a computer simulation program								
Learning outcomes	Course outcome		Subject outcome			Method of verification			
	K7_U10		Student is able to plan and carry out laboratory experiments in order to evaluate the efficiency of wastewater treatment and sewage sludge disposal.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			
	K7_U11		Student is able to plan and carry out laboratory experiments in order to evaluate the efficiency of wastewater treatment and sewage sludge disposal.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			
	K7_W07		Student recognizes, specifies and describes wastewater treatment technologies and sludge disposal technologies. Characterizes mathematical models of the processes.			[SW1] Assessment of factual knowledge			
	K7_U07		Student is able to plan and carry out laboratory experiments in order to evaluate the efficiency of wastewater treatment and sewage sludge disposal.			[SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment			
	K7_U12		Student prepares a project of a wastewater treatment plant.			[SU4] Assessment of ability to use methods and tools			
Subject contents	Wastewater sources and flows. Wastewater characterization based on physical and biodegradation criteria. Preliminary treatment unit operations (screens, grit chambers, primary clarifiers). Biological processes (suspended growth vs. attached growth) for wastewater treatment. Principles of biological nutrient removal (nitrification, denitrification, enhanced biological phosphorus removal). Implementation of biological nutrient removal processes in mainstream and sidestream treatment lines. Secondary clarifiers. Advanced treatment processes (tertiary treatment, physical-chemical treatment). Sludge handling processes (thickening, anaerobic vs. aerobic digestion, dewatering). Mathematical models of wastewater treatment processes.								

Prerequisites					
and co-requisites		·	·1		
Assessment methods	Subject passing criteria	Passing threshold	Percentage of the final grade		
and criteria	Project	60.0%	20.0%		
	Exam	50.0%	70.0%		
	Laboratory (report)	60.0%	10.0%		
Recommended reading	Basic literature	<ol> <li>Metcalf and Eddy, Inc. (2003). Wastewater Engineering, 4th Edition. McGraw Hill, New York.</li> <li>Grady, C.P.L., Daigger G.T. and Lim H.C. (1999). Biological Wastewater Treatment. Second Edition, Revised and Expanded. Marcel Dekker, New York.</li> <li>Henze M., Harremoës P., Jes la Cour J., Arvin E. (1995). Wastewater Treatment. Biological and Chemical Processes. Springer-Verlag Berlin.</li> </ol>			
	Supplementary literature				
	eResources addresses	Adresy na platformie eNauczanie:			
Example issues/ example questions/ tasks being completed	<ol> <li>How can the wastewater flowrate data be analyzed?</li> <li>Flowrates for the design and operation of wastewater treatment facilities.</li> <li>What are the key components of wastewater and their typical concentrations?</li> <li>Draw a typical treatment system for municipal wastewater. What are the typical removal efficiencies of most common constituents at each stage of treatment?</li> <li>Physical characterization of wastewater s. characterization based on the biodegradability criteria.</li> <li>Briefly describe processes used for preliminary and mechanical treatment (schematic diagrams, dimensions, design considerations).</li> <li>Principles of bacterial growth in activated sludge systems.</li> <li>Nitrogen cycle in wastewater treatment plants.</li> <li>Briefly describe the nitrification process (reaction, microorganisms involved, factors influencing process kinetics).</li> <li>Briefly describe the denitrification process (reaction, microorganisms involved, factors influencing process kinetics).</li> <li>Briefly describe enhance biological P removal (principle, microorganisms involved, factors influencing process kinetics).</li> <li>Types of bioreactors in terms of hydrodynamic conditions (including the responses to tracer dosing) an wastewater feeding.</li> <li>Briefly describe and compare common systems for N removal.</li> <li>Principles of the design and operation of modern BNR activated sludge systems (show typical example of BNR systems for combined N and P removal)</li> <li>Advantages and disadvantages of computer simulation of wastewater treatment processes.</li> <li>How can the setting characteristics of activated sludge be determined.</li> <li>Solids mass balances for the clarifier.</li> <li>How can the source of the clarifier (construction, design parameters).</li> <li>General characteristics of membrane processes in wastewater treatment plants. Briefly describe each unit processe.</li> <li>How can the source of</li></ol>				
Work placement	Not applicable				

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