GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Fundamentals of environmental microbiology, PG_00066637						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2025		Academic year of realisation of subject	2025/2026			
Education level	first-cycle studies		Subject group				
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	4.0			
Learning profile	general academic profile		Assessment form	assessment			
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Katarzyna Jankowska				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	0.0	30.0	0.0	0.0	50
	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	50		0.0	0.0		50
Subject objectives	Understanding the role of microorganisms in the natural environment and in environmental engineering, as well as the principles of microbiological monitoring. Ability to perform basic chemical calculations.						

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] applies knowledge of mathematics and other exact sciences and engineering disciplines to solve theoretical, engineering and technological problems and issues.	He has knowledge of living organisms, basic biological processes, the presence of microorganisms in natural environments, and their importance in environmental engineering. He independently conducts microscopic observations, identifies and describes the structure of microorganisms, and possesses the ability to solve problem-based tasks.	[SU3] Assessment of ability to use knowledge gained from the subject [SU1] Assessment of task fulfilment [SU4] Assessment of ability to use methods and tools
[K6_W01] demonstrates knowledge and understanding of mathematics and other exact sciences and engineering disciplines at the level necessary to solve theoretical, engineering and technological problems and issues.	He has knowledge of living organisms, basic biological processes, the presence of microorganisms in natural environments, and their importance in environmental engineering. He independently conducts microscopic observations, identifies and describes the structure of microorganisms, and possesses the ability to solve problem-based tasks.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge
[K6_U02] solves engineering issues and problems in the area of raw materials and energy recovery through the use of appropriate analytical, numerical and experimental tools and methods.	He has knowledge of living organisms, basic biological processes, the presence of microorganisms in natural environments, and their importance in environmental engineering. He independently conducts microscopic observations, identifies and describes the structure of microorganisms, and possesses the ability to solve problem-based tasks.	[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment
[K6_W02] analyzes engineering and technological issues and problems in the area of raw materials and energy recovery using appropriate and appropriate analytical, numerical and experimental tools and methods	He works both independently and as part of a team, performing microscopic observations and solving problem-based tasks. In the biology lab, he follows health and safety regulations and demonstrates care for equipment and biological collections.	[SW3] Assessment of knowledge contained in written work and projects [SW1] Assessment of factual knowledge

Subject contents

Course content – lecture

Lectures:

Microorganisms as a fundamental component of nature responsible for the circulation of matter. Characteristics of microorganisms and their role in the aquatic environment. Self-purification of water, unit processes, oxygen sag curve. Saprobic index. Growth of microorganisms and their nutritional requirements. Metabolism. Kinetics of enzymatic reactions. Energy sources for heterotrophs: aerobic respiration, anaerobic respiration, fermentation. Energy sources for autotrophs: lithotrophs and phototrophs. Microbiological threats to water quality. Effects of physical and chemical factors on microorganisms (including disinfection methods). Fundamentals of biological wastewater treatment methods: activated sludge, biological beds. Biological methods for nitrogen and phosphorus removal from wastewater. Anaerobic wastewater treatment and sewage sludge stabilization. Sanitary aspects of wastewater and sludge treatment. Biological stability of water in distribution systems.

Laboratories:

Basics of microscopy techniques. Microscopic analysis of microorganisms present in natural waters. Determination of the saprobic index. Bacterial growth on solid and liquid media, bacterial staining, morphology and structure of bacterial cells. Influence of environmental factors on microorganisms. Bacteriological analysis of water and air, including indicator bacteria. Biocenosis of activated sludge and biofilm.

Prerequisites and co-requisites

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Exam	60.0%	100.0%
Recommended reading	Basic literature	Laboratorium z biologii środowiska, Krystyna Olańczuk-Neyman. Skrypt, Politechnika Gdańska Mikrobiologia techniczna, tom 1, Red. Z. Libudzisz, K. Kowal, Z. Żakowska. Wydawnictwo Naukowe PWN Warszawa 2021.Błaszczyk M.K.: Mikroorganizmy w ochronie środowiska, Wydawnictwo Naukowe PWN Warszawa 2007. Błaszczyk M.K.: Mikrobiologia środowisk, Wydawnictwo Naukowe PWN Warszawa 2010.	
	Supplementary literature	Życie bakterii, Kunicki Goldfinger W.J.H. Wydawnictwo Naukowe PWN, Warszawa 2006. Mikrobiologia Wód, Red. J. Paluch PWN, Warszawa 1973. Biologia Wód Śródlądowych, Mikulski J., PWN Warszawa 1974. Mikrobiologia ogólna, Schlegel H.G., Wydawnictwo Naukowe PWN, Warszawa 2005. Mikrobiologia Krótkie wykłady, Nicklin J., Graeme-Cook K., Paget T., Killington R., Wydawnictwo Naukowe PWN, Warszawa 2021,	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Practical activites within the subject	Not applicable		

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