



## Subject card

Subject name and code	Principles of biology in environmental engineering, PG_00043531							
Field of study	Environmental Engineering							
Date of commencement of studies	October 2021	Academic year of realisation of subject			2022/2023			
Education level	first-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	2	Language of instruction			Polish			
Semester of study	3	ECTS credits			5.0			
Learning profile	general academic profile	Assessment form			exam			
Conducting unit	Department of Environmental Engineering Technology -> Faculty of Civil and Environmental Engineering							
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Katarzyna Jankowska						
	Teachers	dr hab. Katarzyna Jankowska dr hab. inż. Aneta Łuczkiwicz						
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM	
	Number of study hours	30.0	15.0	15.0	0.0	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		8.0		65.0	133	
Subject objectives	The role of microorganisms in the environment and environmental engineering. Biological monitoring.							
Learning outcomes	Course outcome		Subject outcome			Method of verification		
	[K6_K01] can think and act in a creative and enterprising way; can set priorities for the implementation of an individual or group task; understands the need for continuous training and professional responsibility for their activities and team		Knowledge of living organisms, fundamental biological processes, the prevalence of microorganisms in natural environments as well as their role in environmental engineering. Proper microscope usage, problem solving skills			[SK3] Assessment of ability to organize work		
[K6_W03] has a structured and theoretically founded knowledge in the field of chemistry and biology, including knowledge necessary to understand the technological processes related to water treatment, wastewater treatment, waste management and sludge management		Student works alone and in a team performing microscopic observation and problem-solving tasks. The laboratory facilities comply with safety rules and shows attention to equipment .			[SW1] Assessment of factual knowledge			

Subject contents	<p><b>Lectures</b> Microorganisms as a primary factor in ensuring natural circulation of matter. Characteristics of microorganisms: viruses, bacteria, algae. The role of algae in aquatic environments. Point and nonpoint source of water contamination. Oxygen line. The saprobic index as a basis for the assignment of water qual. Toxic water, testing methods. The growth of microorganisms. The nutritional requirements of microorganisms. Metabolism. The kinetics of enzymatic reactions. Energy source for heterotrophs, aerobic respiration, anaerobic respiration, fermentation. Energy source for autotrophs: litotrophy and fototrophy. Microbiological threats in potable water. Effect of physical and chemical factors on microorganisms. Disinfection of drinking water, chemical and physical methods, the sensitivity of microorganisms. Fundamentals of biological treatment of wastewater. Activated sludge and biofilters, the conditions of work. Biological methods to remove nitrogen and phosphorus from wastewater. Anaerobic wastewater treatment and disposal of sewage sludge. Sanitary aspects of wastewater and sewage sludge disposal. Biological stability of potable water in the water network.</p> <p><b>Tutorials</b> Types of microscopes used in biological research. The role of cyanobacteria, algae, protozoa and multicellular animals that occur in natural waters. Air microflora. Environmental factors that impact on bacteria. Bacteriological analysis of water. Heterotrophic bacteria and indicator bacteria in environment. Biocenosis of activated sludge and biological filters.</p> <p><b>Laboratories</b> Microscopy technique. Presence of cyanobacteria, algae, protozoa and multicellular animals in waters. Bacterial growth on solid and liquid media. Bacterial staining. Bacterial morphology and cells structure. Environmental factors and the bacterial growth rate. Sanitary quality of surface waters. Properties and quality of activated sludge.</p>														
Prerequisites and co-requisites	Basic knowledge in biology, chemistry and ecology.														
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="456 864 794 891">Subject passing criteria</th> <th data-bbox="799 864 1137 891">Passing threshold</th> <th data-bbox="1142 864 1481 891">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 898 794 925">Laboratories - reports</td> <td data-bbox="799 898 1137 925">60.0%</td> <td data-bbox="1142 898 1481 925">15.0%</td> </tr> <tr> <td data-bbox="456 931 794 958">Lectures- written exam</td> <td data-bbox="799 931 1137 958">60.0%</td> <td data-bbox="1142 931 1481 958">60.0%</td> </tr> <tr> <td data-bbox="456 965 794 992">Tutorials - two written tests</td> <td data-bbox="799 965 1137 992">60.0%</td> <td data-bbox="1142 965 1481 992">25.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	Laboratories - reports	60.0%	15.0%	Lectures- written exam	60.0%	60.0%	Tutorials - two written tests	60.0%	25.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>Wastewater Microbiology, Gabriel Bitton, John Wiley &amp; Sons, 2005</p> <p>R.M. Atlas, R. Bartha: Microbial Ecology. Addison-Wesley Publishing Company, Reading 1981</p> <p>Water Quality Assessments: Ed. Chapman&amp;Hall, London 1992</p> <p>Microbial Enzymes in Aquatic Environments: Ed. R.J. Chróst Springer Verlag New York 1991</p> <p>Guidelines for drinking-water quality, third edition, incorporating first and second addenda <a href="http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/">http://www.who.int/water_sanitation_health/dwq/gdwq3rev/en/</a></p> <p>Adresy na platformie eNauczanie:</p>													
Example issues/ example questions/ tasks being completed															
Work placement	Not applicable														