



## 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 2020		Academic year of realisation of subject		2021/2022		
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				
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						
	Adresy na platformie eNauczanie:						
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				
	[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 .				

Subject contents	<p>Lectures</p> <p>Microorganisms as a primary factor in ensuring natural circulation of matter. Characteristics of micro-organisms: 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: litotrofy and fototrofy. 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>Tutorials</p> <p>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>Laboratories</p> <p>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	Subject passing criteria	Passing threshold	Percentage of the final grade
	Laboratories - reports	60.0%	15.0%
	Tutorials - two written tests	60.0%	25.0%
	Lectures- written exam	60.0%	60.0%
Recommended reading	Basic literature	Wastewater Microbiology, Gabriel Bitton, John Wiley & Sons, 2005	
		R.M. Atlas, R. Bartha: Microbial Ecology. Addison-Wesley Publishing Company, Reading 1981	
		Water Quality Assessments: Ed. Chapman&Hall, London 1992	
		Microbial Enzymes in Aquatic Environments: Ed. R.J. Chróst Springer Verlag New York 1991	
	Supplementary literature	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>	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		