GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	Environmental biological processes , PG_00057781		
Field of study	Green Technologies		
Date of commencement of studies	October 2024	Academic year of realisation of subject	2025/2026
Education level	first-cycle studies	Subject group	Optional subject group
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	3.0
Learning profile	general academic profile	Assessment form	assessment
Conducting unit	Department of Biotechnology and Microbiology -> Faculty of Chemistry -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	prof. dr hab. inż. Paweł Sachadyn	
	Teachers	mgr Karolina Sołowińska prof. dr hab. inż. Paweł Sachadyn dr hab. inż. Anna Brillowska-Dąbrowska	

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	15.0	0.0	30.0	0.0	0.0	45

E-learning hours included: 0.0

eNauczanie source address: https://enauczanie.pg.edu.pl/moodle/course/edit.php?id=7233

Moodle ID: 2707 Environmental biological processes LABS
https://enauczanie.pg.edu.pl/2025/course/view.php?id=2707

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	45	5.0	25.0	75

Subject objectives

Lecture

The aim of the subject is:
- to give the basic knowledge on microbial world, fundamentals of microbiology and molecular biology, which is necessary to
- demonstrate the role of microorganims in the environment

Laboratory

The aim of the course is to provide students with a comprehensive understanding of natural biological processes involved in environmental protection, including the decomposition of organic matter, self-purification mechanisms in aquatic and terrestrial ecosystems, biodegradation of pollutants, and the capacity of living organisms to bind or neutralize toxic substances. The course is designed to develop students practical competencies in the observation, analysis, and interpretation of biological processes occurring in natural environments.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K6_U01] is able to obtain information from literature, databases and other sources, is able to integrate the information obtained, to make their interpretation, as well as draw conclusions and formulate and justify opinions, take part in the discussion	The student is able to independently acquire information from scientific literature, databases, and other reliable sources, and relate these data to the experiments conducted.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information
[K6_K01] understands the need for learning throughout life, can inspire and organize the learning process of others. Is aware of his/ her own limitations and knows when to ask the experts, can properly identify priorities for implementation, critically evaluate his knowledge	The student is able to use expert studies and relate their content to the experimental results obtained during the course.	[SK2] Assessment of progress of work
[K6_W04] is aware of the importance of environmental protection and has a basic knowledge of chemical and biological threats to the environment, with particular emphasis on anthropogenic factors, has a basic knowledge of knowledge of the principles of sustainable development as well as national and European environmental management conditions.	The student knows and understands the influence of living organisms on the condition and functioning of environment.	[SW1] Assessment of factual knowledge
[K6_U04] capable of formulating and solving design tasks in the field of environmental technology to recognize their non-technical aspects, including environmental, economic and legal. Is capable of applying the principles of occupational health and safety. Is able to make initial assessment of engineering solutions and actions	The student is able to identify and assess the significance of natural biological processes in the context of environmental protection. The student applies the principles of safety and hygiene at work while conducting laboratory experiments.	[SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents

Course content – lecture
1. Introduction to the world of microbes.
2. Principles of microscopy and staining.
3. Sterilization and disinfection.
4. Cultivation of microorganisms.
5. Microbial ecology, aquatic and soil biogeochemical cycles, mutagens and gene transfer

Course content – laboratory
The course covers issues related to natural biological processes occurring in the environment and their application in the protection of natural resources. It discusses key microbiological and biochemical processes that govern the circulation of matter in ecosystems, including the decomposition of organic compounds, transformations of biogenic elements, and mechanisms of self-purification in soil and aquatic environments.

The course includes the analysis of biodegradation, bioaccumulation, and biotransformation processes, as well as the role of microorganisms and plants in environmental detoxification. It also addresses the use of living organisms in environmental biotechnology, particularly in phytoremediation and biosensing. Special emphasis is placed on understanding the interactions between microorganisms, plants, and anthropogenic factors, and on linking these processes to the principles of sustainable development.

An integral part of the course is the development of skills in analyzing and interpreting environmental research results, using scientific literature and databases, and adhering to safety and hygiene regulations in the biological laboratory.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Lecture	60.0%	60.0%
Laboratories - eight reports	60.0%	40.0%

<table>
<tr><td rowspan="3">Recommended reading</td><td>Basic literature</td><td>Lecture

lecture presentations provided by the lecturer

Laboratory

materials provided by the academic teacher on the e-learning platform</td></tr>
<tr><td>Supplementary literature</td><td>Lecture

Eugene Nester, C. Evans Roberts, Martha Nester, Microbiology a Human Perspective
Jacquelyn G. Black, Microbiology - Principles & Applications

Laboratory

n/a</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td colspan="2">Lecture

Lecture 5: Microbial ecology, aquatic and soil biogeochemical cycles

• The role of microbes in biogeochemical cycles: carbon cycle, nitrogen cycle, sulphur cycle, phosphorous cycle .The biologically available forms of C, N, S, P. Greenhouse effect.
• Microorganisms in soil: limiting factors, the main groups of soil microbes, decomposition of synthetic chemicals, soil pathogens of plants and animals.
• Microorganisms in waters: limiting factors.The zones in lake and the habitants of zones. The role of phytoplancton. Conditions in oceans.Eutrophication, BOD. Biological magnification.
• Microorganisms in air: typical representatives and control
• Microbial competition.

Laboratory: Phytoremediation

Report on the impact of heavy metals on plant growth and development

• Theoretical introduction (adequacy and accuracy 20%)
• Methodology (completeness and accuracy 20%)
• Results (accuracy 20%)
• Conclusions and discussion (accuracy of conclusions, correctness of references to the state of the art 20%)
• Literature (completeness and correctness of citations 20%)</td></tr>
<tr><td>Practical activites within the subject</td><td colspan="2">Not applicable</td></tr>
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