University of Silesia in Katowice

1.	Field of study	**Biology**
2.	Faculty	Faculty of Natural Sciences
3.	Academic year of entry	2021/2022 (winter term), 2022/2023 (winter term)
4.	Level of qualifications/degree	second-cycle studies
5.	Degree profile	general academic
6.	Mode of study	full-time

Module: Environmental biotechnology

Module code: 2BL_49a

1. Number of the ECTS credits: 4

2. Learning outcomes of the module			
code	**description**	**learning outcomes of the programme**	**level of competence (scale 1-5)**
2BL_49_01	Student has a deep knowledge of environmental biotechnology.	2BL_W01_P 2BL_W05_P	5 5
2BL_49_02	Student names and describes plants and microorganisms that can be applied in bioremediation of polluted environments.	2BL_W01_P 2BL_W07_P	4 4
2BL_49_03	Student names and describes methods used to improve organisms potentially applicable in environmental biotechnology.	2BL_K03_P 2BL_U01_P 2BL_W04_P	4 5 4
2BL_49_04	Student employs advanced biotechnological methods and techniques to characterize and modify microorganisms.	2BL_U03_P	5
2BL_49_05	Student demonstrates the ability for critical analysis of results of the experiments.	2BL_U01_P 2BL_U03_P	5 4
2BL_49_06	Student understands the need of using biological methods in environmental protection and provides the public with information about new achievements of environmental biotechnology.	2BL_K01_P 2BL_K02_P	4 4
2BL_49_07	Student is able to work independently as well as in group, follows the rules of laboratory work.	2BL_K04_P 2BL_U04_P	4 5

3. Module description
Description

<table>
<tr><td rowspan="1"></td><td>The module is aimed at gaining a detailed knowledge of environmental biotechnology. It provides students with a broad, detailed knowledge about the different ways of application of microorganisms and plants in the treatment of environments contaminated with heavy metals, nanomaterials and toxic organic compounds as pesticides and aromatic hydrocarbons. Students also gain knowledge of the molecular mechanisms determining bacterial resistance to heavy metals and metal nanoparticles, ability of microorganisms to degrade aromatic hydrocarbons and organic pesticides, and biocontrol potential of bacteria. The module also provides the knowledge about the methods of genetic modification of microorganisms aimed at improving their catabolic activity, as well as the enhancement of the enzymes utilized for environment protection. During classes students acquaint themselves with methods used in environmental biotechnology, acquire practice in collecting and analysis of empirical data, interpretation of the results and formulation of the conclusions.</td></tr>
<tr><td>**Prerequisites**</td><td>Principles of biotechnology, microbiology, molecular genetics and biochemistry at the undergraduate level.</td></tr>
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4. Assessment of the learning outcomes of the module

code	type	description	learning outcomes of the module
2BL_49_w_1	credit for a grade	according to the rules set out in the syllabus	2BL_49_01, 2BL_49_02, 2BL_49_03, 2BL_49_04, 2BL_49_05, 2BL_49_06, 2BL_49_07

5. Forms of teaching

code	form of teaching			required hours of student's own work		assessment of the learning outcomes of the module
	type	description (including teaching methods)	number of hours	description	number of hours	
2BL_49_fs_1	lecture	Lectures illustrated by the examples of the lecturer's work and quoted from the literature. Using of audiovisual devices, applications as quizizz, mentimeter, and inverted class method.	15	Acquiring knowledge of lectures; work with the recommended literature, reading the indicated specialized articles and online sources.	10	2BL_49_w_1
2BL_49_fs_2	laboratory classes	Individual or group work under the tutor's supervision; performing the experiments according to the protocols; analysis of the results. The use of applications, internet games (quizizz, kahoot, mentimeter), and the inverted class method.	45	Preparation to the classes using recommended literature and instructions; work on reports, mini project/essay.	30	2BL_49_w_1