

**Subject card**

Subject name and code	Biotechnology in environmental protection, PG_00117757						
Field of study	Chemistry						
Date of commencement of studies	October 2024	Academic year of realisation of subject			2024/2025		
Education level	postgraduate studies	Subject group			Obligatory subject group in the field of study		
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			1.0		
Learning profile	academic	Assessment form					
Conducting unit	Pracownia Bionanotechnologii -> Katedra Biotechnologii Molekularnej -> Faculty of Chemistry						
Name and surname of lecturer (lecturers)	Subject supervisor		dr Joanna Jeżewska-Fraćkowiak				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	0.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						
Additional information: presentation, discussion, peer review							
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	15		0.0		0.0	15
Subject objectives	1. Familiarizing students with the issues mentioned in the lecture program content 2. Getting to know the issues of classical biotechnology in environmental protection and presenting modern issues and prospects for the use of molecular biotechnology methods.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[CHEMMU2_W03] Demonstrates extended knowledge in the field of modern measuring techniques used in chemical analysis.	The student knows the possibilities of using biotechnology in environmental diagnostics.			[SW4] test/exam - oral or written		
	[CHEMMU2_U04] Applies acquired knowledge of chemistry and related scientific disciplines.	The student independently plans and performs assigned laboratory tasks, manages time and available infrastructure.			[SU2] presentation/project/paper/report [SU6] demonstration of practical skills [SU8] observation of student's independent or team work		
	[CHEMMU2_W10] Uses knowledge of the principles of operation of the basic scientific and research apparatus used in chemistry.	The student knows biotechnological methods of gas, sewage and soil purification.			[SW4] test/exam - oral or written		
	[CHEMMU2_W05] Has extended knowledge in the field of the specialisation studied.	The student knows the methodology for obtaining GMO varieties and understands the purposefulness of using genetically modified organisms in environmental protection.			[SW4] test/exam - oral or written [SW5] implementation of a problem task		
	[CHEMMU2_K01] Knows the limitations of her/his own knowledge; understands the need for further education and can inspire other people to do so.	The student is critical when expressing opinions and is aware of the possibilities created by modern biotechnology. Selects reliable sources of information in the field of biotechnology.			[SK1] oral statement/conversation/discussion [SK5] implementation of a problem task		

Subject contents	Definitions and spectrum of biotechnology issues in environmental protection, phylogenetic tree of life, molecular cloning and cloning of organisms, determination of the number of microorganisms in environmental samples, PCR reaction methodology, principle of detection of GMO organisms, spectrum of applications of modern biotechnology, anthropogenic pollution, biotechnological processes in environmental protection, cellular localization of biodegradation processes, biodegradation engineering, wastewater treatment using the activated sludge method, bioindicators, hydrocarbon biodegradation, biodegradable polymers, land purification of petroleum products, conventional and recombinant enzymes, starch biodegradation, cellulose utilization, vitamin C biosynthesis, lactic acid bacteria and Bacillus bacteria, biodiversity protection, transgenic plants and animals, plants as bioreactors, insecticides of bacterial origin, bioethical issues related to genetic modifications, GMO legal regulations.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	written exam in session	51.0%	50.0%
	colloquium during a lecture	0.0%	30.0%
	discussion (oral/written, literature)	0.0%	10.0%
	presentation in pairs	0.0%	10.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Glick B.R., Pasternak J.J., Patten Ch. L. Molecular biotechnology 4th Ed. , ASM PRESS 2010</li> <li>2. Libudzisz Z., Kowal K., Żakowska Z. Mikrobiologia techniczna T 2 , PWN 2008</li> <li>3. Klimiuk E., Łebkowska M. Biotechnologia w ochronie środowiska, PWN 2005</li> <li>4. Querci M., Maretti M., Mazzara M. Badanie próbek żywności na obecność Genetycznie Zmodyfikowanych Organizmów. European Comission Joint Research Centre, World Health Organization, Regional Office for Europe</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>6. Klimiuk E., Łebkowska M.: Biotechnologia w ochronie środowiska, PWN, 2005</li> <li>7. Glick, B.R., Pasternak, J.J., Patten, C.L.: Molecular biotechnology: Principles and applications of recombinant DNA. ASM PRESS, 2009</li> <li>8. Libudzisz Z., Kowal K., Żakowska Z.: Mikrobiologia techniczna, tom 2, PWN 2008</li> <li>9. Olańczuk-Neyman K.: Laboratorium z biologii środowiska, Wyd. PG, 1998</li> </ol> <p>indicated on-line reosurces</p>	
	eResources addresses	Adresy na platformie eNauczanie:	
Example issues/ example questions/ tasks being completed	<p>test questions</p> <p>biogas, syngas, biofuels, activated sludge, biodegradable polymers</p> <p>molecular cloning</p> <p>legal status of GMOs in agriculture</p>		
Work placement	Not applicable		

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