

Subject card

Subject name and code	Pharmaceuticals in the aquatic environment - origin, transformations, threats, PG_00179647						
Field of study	Environmental Protection						
Date of commencement of studies	October 2026		Academic year of realisation of subject		2027/2028		
Education level	Master's 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	4		ECTS credits		1.0		
Learning profile	academic		Assessment form		credit		
Conducting unit	Department of Experimental Biology and Plant Biotechnology -> Faculty of Biology -> Rector						
Name and surname of lecturer (lecturers)	Subject supervisor		dr hab. Anna Aksmann				
	Teachers						
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	15.0	0.0	0.0	0.0	15
	E-learning hours included: 0.0						
	Additional information: .						
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		2.0		8.0	25
Subject objectives	Familiarizing students with selected aspects of environmental pollution with substances produced by the pharmaceutical industry.						
	Indicating the sources of these pollutants and discussing the possible changes that such substances may undergo in the cells of living organisms and in the environment.						
	Drawing attention to the threats associated with the presence of pharmaceutical pollutants in the environment and the possibilities of preventing the effects of their action.						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[OŚMU2_W01] Describes complex phenomena and processes occurring in nature, including those related to the spread of anthropogenic pollution.	Provides an in-depth description of the complex phenomena and processes occurring in nature related to the spread of pharmaceutical contaminants.	[SW1] oral statement/ conversation/discussion
	[OŚMU2_K05] Critically assesses her/his own knowledge and the knowledge of the teams in which s/he works, can critically assess the content received.	Critically evaluates his/her own knowledge and the knowledge of the teams in which he/she works, and is able to critically evaluate the content received within the scope covered during classes.	[SK8] observation of student's independent or team work
	[OŚMU2_U07] Has advanced skills in presenting the results of own research, discussions based on literature data and public speaking, including leading a debate.	Possesses advanced skills in presenting results published in the scientific literature, discussions based on literature data, and public speaking.	[SU2] presentation/project/paper/report
	[OŚMU2_U05] Searches, selects and analyses the literature achievements of environmental sciences, including scientific journals and databases, reading and understanding scientific texts in her/his native language and in English.	Searches, selects and analyses literature on aquatic environmental pollution, including scientific journals and databases, reading with understanding scientific texts in Polish and English.	[SU2] presentation/project/paper/report
	[OŚMU2_W03] Characterises the effects of human interference in the natural environment and explains the mechanisms of reaction of living organisms to its pollution.	Characterizes the effects of human interference in the natural environment and explains the mechanisms of the response of living organisms to its contamination with pharmaceutical substances.	[SW2] presentation/project/paper/report
Subject contents	Sources of contamination of the aquatic environment with pharmaceuticals. Pharmaceutical contaminants found in the environment in the largest quantities. Transformations of medicinal substances in the cells of living organisms and in the environment - selected issues. Effects of environmental contamination with pharmaceuticals and methods of preventing environmental contamination with these substances.		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Completion of a project or presentation	51.0%	100.0%
Recommended reading	Basic literature	Kümmerer, K. (Ed.). (2008). Pharmaceuticals in the environment: sources, fate, effects and risks. Springer Science & Business Media. Brooks, B. W., & Huggett, D. B. (Eds.). (2012). Human pharmaceuticals in the environment: current and future perspectives (Vol. 4). Springer Science & Business Media. Harshkova D., Aksmann A. Zanieczyszczenie środowiska niesteroidowymi lekami przeciwzapalnym na przykładzie diklofenaku przyczyny, skutki, bioidnykacja. Kosmos (2019) 322, 185÷194 Hejna, M., Kapuścińska, D., & Aksmann, A. (2022). Pharmaceuticals in the aquatic environment: A review on eco-toxicology and the remediation potential of algae. International Journal of Environmental Research and Public Health, 19(13), 7717. Selected papers from scientific journals.	
	Supplementary literature	Aga, D. S. (Ed.). (2007). Fate of pharmaceuticals in the environment and in water treatment systems. CRC Press. Karthikeyan, O. P., Mehariya, S., & Bhatia, S. K. (Eds.). (2022). Algal Biorefineries and the Circular Bioeconomy: Industrial Applications and Future Prospects. CRC Press.	
	eResources addresses		

Example issues/ example questions/ tasks being completed	.
Work placement	Not applicable

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