

**Subject card**

<b>Subject name and code</b>	Metals in the Marine Environment - lecture, PG_00204982						
<b>Field of study</b>	Oceanography						
<b>Date of commencement of studies</b>	October 2026	<b>Academic year of realisation of subject</b>			2027/2028		
<b>Education level</b>	Master's studies	<b>Subject group</b>			Obligatory subject group in the field of study Optional subject group Subject group related to scientific research in the field of study		
<b>Mode of study</b>	full-time studies	<b>Mode of delivery</b>			at the university		
<b>Year of study</b>	2	<b>Language of instruction</b>			Polish		
<b>Semester of study</b>	3	<b>ECTS credits</b>			2.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			exam		
<b>Conducting unit</b>	Laboratory of Toxic Substances Transformation -> Department of Chemical Oceanography and Marine Geology -> Faculty of Oceanography and Geography -> Rector						
<b>Name and surname of lecturer (lecturers)</b>	Subject supervisor		prof. dr hab. Magdalena Beldowska				
	Teachers						
<b>Lesson types</b>	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	0.0	0.0	0.0	30
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	Learning activity	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	Number of study hours	30		2.0		18.0	50
<b>Subject objectives</b>	Learning about the circulation of metals in the marine environment, with particular emphasis on re-emission and remobilisation. Presentation of the toxicity of metals in the marine environment.						
<b>Learning outcomes</b>	<b>Course outcome</b>		<b>Subject outcome</b>		<b>Method of verification</b>		
	[OCEANMU2-W02] knows and understands complex processes and phenomena occurring in the marine environment, with particular emphasis on the coastal zone, as well as complex relationships between living and non-living elements of the aquatic environment		in detail can explain the causes and effects of changes in the concentration of metals in different elements of the marine environment marine environment		[SW4] test/exam - oral or written		
	[OCEANMU2-W06] knows and identifies potential threats to the marine environment on a local and global scale resulting from strong anthropopressure, predicts their effects on various time and space scales		In an advanced manner can explain the causes and effects of changes in the concentration of metals in different elements of the marine environment marine environment		[SW4] test/exam - oral or written		

Subject contents	<ol style="list-style-type: none"> <li>1. Characteristics of metals (including toxicity), their sources and uses;</li> <li>2. Metals in the atmosphere;</li> <li>3. Metals in seawater;</li> <li>4. Metals in marine organisms (including bioconcentration, bioaccumulation, biomagnification);</li> <li>5. Metals in marine sediments;</li> <li>6. Metals input to the sea (including remobilisation from land);</li> <li>7. Impact of climate change on the environmental cycling of metals.</li> </ol>								
Prerequisites and co-requisites									
Assessment methods and criteria	<table border="1" data-bbox="448 468 1487 533"> <thead> <tr> <th data-bbox="448 468 798 499">Subject passing criteria</th> <th data-bbox="802 468 1141 499">Passing threshold</th> <th data-bbox="1145 468 1487 499">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="448 506 798 533">written/oral exam</td> <td data-bbox="802 506 1141 533">51.0%</td> <td data-bbox="1145 506 1487 533">100.0%</td> </tr> </tbody> </table>			Subject passing criteria	Passing threshold	Percentage of the final grade	written/oral exam	51.0%	100.0%
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Recommended reading	<p>Basic literature</p> <p>Supplementary literature</p> <p>eResources addresses</p>	<p>Piotr Szefer, Metals, metalloids, and radionuclides in the Baltic Sea ecosystem, 2002 Elsevier</p> <p>Alina Kabata-Pendias, Arun B. Mukherjee. Trace Elements from Soil to Human, 2007 Springer</p> <p>the latest scientific publications from renowned journals</p>							
Example issues/ example questions/ tasks being completed	<ol style="list-style-type: none"> <li>1. Describe how and why the concentration of metals in the water column changes using the Baltic Sea as an example.</li> <li>2. List the biotic/abiotic factors affecting the bioaccumulation of metals in marine organisms. Describe the influence of several factors.</li> <li>3. What parameters should be measured when studying changes in lead concentration in bottom sediments. Discuss briefly the influence of five of these.</li> <li>4. What factors need to be taken into account when estimating metal inputs to the sea.</li> <li>5. How does climate change affect the circulation of metals in the marine environment</li> </ol>								
Work placement	Not applicable								

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