

**Subject card**

<b>Subject name and code</b>	Physical Oceanography - laboratory , PG_00206133						
<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>	Bachelor'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>			3.0		
<b>Learning profile</b>	academic	<b>Assessment form</b>			credit		
<b>Conducting unit</b>	Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector						
<b>Name and surname of lecturer (lecturers)</b>	<b>Subject supervisor</b>		dr Marek Kowalewski				
	<b>Teachers</b>						
<b>Lesson types</b>	<b>Lesson type</b>	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	<b>Number of study hours</b>	0.0	0.0	45.0	0.0	0.0	45
	E-learning hours included: 0.0						
<b>Learning activity and number of study hours</b>	<b>Learning activity</b>	Participation in didactic classes included in study plan		Participation in consultation hours		Self-study	SUM
	<b>Number of study hours</b>	45		3.0		27.0	75
<b>Subject objectives</b>	<p>To know and understand:</p> <ul style="list-style-type: none"> <li>• spatial and temporal variation of temperature, salinity and density of seawater and the processes that shape this variation</li> <li>• basic dynamic processes in the sea (forces acting on water masses in the sea, geostrophic currents, Ekman theory, mixing, wind waves)</li> <li>• fundamentals of marine acoustics (sound propagation and refraction in the sea; sound channel)</li> </ul>						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[OCEANL3-U01] is able to use the current scientific terminology in the field of oceanography in various forms of expression	Student is able to use current scientific terminology in presenting and discussing problems in physical oceanography	[SU4] test/exam - oral or written
	[OCEANL3-K04] is willing to constantly deepen knowledge in the field of oceanography and improve professional qualifications, supported by the knowledge of experts	Student is ready to continuously improve his/her knowledge of physical oceanography	[SK5] implementation of a problem task
	[OCEANL3-K03] is ready to exercise caution and criticism in accepting information from scientific literature, the Internet and other media relating to natural sciences	Student is willing to exercise caution and criticism in accepting information from scientific literature, the Internet and other media relating to physical oceanography	[SK3] text preparation/written work
	[OCEANL3-U03] is able to process, describe, and present results, and draw conclusions	Student is able to develop, describe and report on the results of the analyses carried out during the exercises and formulate conclusions based on the results of these analyses.	[SU3] text preparation/written work
	[OCEANL3-W03] has an advanced understanding of the relationships between living and non-living components of aquatic environments, and is aware of the complex nature, intricacy, and natural variability of these environments	Student knows and understands the basic issues/problems of research in physical oceanography: the relationships between the elements of the aquatic environment, is aware of the complex nature of aquatic environments, their complexity and natural variability	[SW5] implementation of a problem task
[OCEANL3-W01] has an advanced knowledge and understanding of the terminology used in oceanography and related exact and natural sciences (in Polish and a selected foreign language)	To an advanced degree, student knows and understands the basic terminology used in physical oceanography; knows and understands the basic research issues/problems in physical oceanography physical oceanography and the complexity of physical processes in the sea.	[SW3] text preparation/written work	
Subject contents	<ol style="list-style-type: none"> <li>1. Visualization of oceanographic data (Ocean data Vlew program).</li> <li>2. Spatial and temporal variability of salinity, temperature and density of seawater. Thermocline and halocline.</li> <li>3. T-S diagrams. Water masses.</li> <li>4. Vertical stability of water masses, Väisälä-Brunta parameter.</li> <li>5. Mixing, differential diffusion of heat and salt, salt fingers. Turner's angle.</li> <li>6. Sound propagation in the sea. Sound channel. Wind currents, Ekman theory, upwelling and downwelling.</li> <li>7. Geostrophic currents. Dynamic method.</li> <li>8. Wind waves.</li> </ol>		
Prerequisites and co-requisites			
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Test	51.0%	50.0%
	Reports from exercises	51.0%	50.0%
Recommended reading	Basic literature	<ol style="list-style-type: none"> <li>1. Talley i in., 1996, Descriptive Physical Oceanography. An Introduction, Elsevier, <a href="https://booksite.elsevier.com/DPO/">https://booksite.elsevier.com/DPO/</a>.</li> <li>2. Stewart, R.H., 2008, Introduction to physical oceanography; <a href="https://open.umn.edu/opentextbooks/textbooks/20">https://open.umn.edu/opentextbooks/textbooks/20</a>.</li> <li>3. Duxbury, A.B. Duxbury A.C., Sverdrup, K.A., 2002, Oceany świata, PWN, 636s.</li> </ol>	
	Supplementary literature	<ol style="list-style-type: none"> <li>1. Lisicki A., 1996, Plywy na morza i oceanach, GTN, 129s.</li> <li>2. Mellor G., 1996, Introduction to physical oceanography, Am. Inst. Phys., 258s.</li> <li>3. Massel S., 2010, Procesy hydrodynamiczne w ekosystemach morskich, Wyd. Univ. Gda., 495s.</li> </ol>	
	eResources addresses		
Example issues/ example questions/ tasks being completed			
Work placement	Not applicable		

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