University of Gdańsk

Subject card

Subject name and code	The Basics of Physical Oceanography - laboratory , PG_00206156		
Field of study	Oceanography		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Subject group related to scientific research in the field of study
Mode of study	full-time studies	Mode of delivery	at the university
Year of study	2	Language of instruction	Polish
Semester of study	3	ECTS credits	2.0
Learning profile	academic	Assessment form	credit
Conducting unit	Laboratory of Physical Oceanography -> Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Katarzyna Bradtke	
	Teachers		

Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	0.0	0.0	30.0	0.0	0.0	30
	E-learning hours included: 0.0						

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	30	2.0	18.0	50

Subject objectives

Understanding and comprehending:

- the spatial and temporal variation of temperature, salinity, and density of water in oceans and the processes shaping this variation.
- the fundamental dynamic processes in the ocean (such as differential mixing and diffusion, wind-driven currents, and wind waves).
- the basics of marine acoustics (sound propagation and refraction in the sea; the sound channel)

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	Students are able to use current scientific terminology in presenting and discussing problems in the field of physical oceanography	[SU3] text preparation/written work
[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)	Students have clear knowledge in the fields of mathematics, physics, chemistry, biology and ecology that is necessary for understanding the basic phenomena and processes occurring in aquatic environment	[SW3] 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	Students have knowledge about the basic concepts and terms used in natural sciences; students understand and can describe basic concepts in the field of marine sciences, and are familiar with the development of oceanography, i.e. with the most important directions and the newest research methods	[SW3] text preparation/written work
[OCEANL3-U03] is able to process, describe, and present results, and draw conclusions	Students use the basic mathematical and statistical methods to analyze data and characterize the phenomena and processes that occur in marine environment	[SU3] text preparation/written work [SU5] 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	Students are ready to undertake professional challenges posed by academic advisor	[SK3] text preparation/written work
[OCEANL3-K04] is willing to constantly deepen knowledge in the field of oceanography and improve professional qualifications, supported by the knowledge of experts	students show activity, persistence and promptness during the realization of individual and team-based tasks	[SK3] text preparation/written work

Subject contents

1. Visualization of Oceanographic Data (Ocean Data View Program). The spatial and temporal variability of seawater salinity, temperature, and density, the depth of thermocline and halocline.

2. T-S Diagrams. Water Masses and their vertical stability, the Väisäla-Brunt parameter.

3. Mixing in the Ocean: Differential diffusion. The Turner angle.

4. Wind-Driven Currents, Ekman Theory, Upwelling, and Downwelling.

5. Wind Waves.

6. Sound Propagation in the Sea and the Sound Channel.

Prerequisites and co-requisites

basic computer skills in Windows environment (scope of courses: "ABC IT", "Technologia informacyjna - ćw. laboratoryjne")

Attending the course Physical Oceanography - lecture in parallel

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Test	51.0%	25.0%
Reports	51.0%	75.0%

Recommended reading

Basic literature

Talley i in., 1996, Descriptive Physical Oceanography. An Introduction, Elsevier, https://booksite.elsevier.com/DPO/.

Stewart, R.H., 2008, Introduction to physical oceanography; https://open.umn.edu/opentextbooks/textbooks/20.

Mellor G., 1996, Introduction to physical oceanography, Am. Inst. Phys., 258s.

Duxbury, A.B. Duxbury A.C., Sverdrup, K.A., 2002, Oceany świata, PWN, 636s.

	Supplementary literature	Lisicki A., 1996, Pływy na morza i oceanach, GTN, 129s. Massel S., 2010, Procesy hydrodynamiczne w ekosystemach morskich, Wyd. Univ. Gda., 495s.
	eResources addresses	
Example issues/ example questions/ tasks being completed	1. Draw vertical profiles of temperature, salinity and nutrient concentration. Determine the depth of the thermocline and halocline and describe their effect on the vertical distribution of nutrient concentrations. 2. Draw a θ-S diagram for a given station. Calculate θ, S and the potential density of the water mass that would result from mixing surface water at the station with a given water mass. Determine these values graphically on the θ-S diagrams and the depth at which the mixture will have neutral buoyancy. 3. Draw contour sections along the given line of the stability parameter N (φ,z) and Turner's angle Tu (φ,z). Mark, on the analyzed profile, the areas that are absolutely stable and favorable for the formation of salty fingers 4. Draw a vertical section of temperature, oxygen concentration and nutrient concentration in the area of coastal upwelling. How does upwelling affect the concentrations of these compounds? 5. Calculate the average height and period of the wave for the given conditions. 6. Determine the location of the sound channel based on the analysis of the vertical variation of the speed of sound.	
Work placement	Not applicable	

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