University of Gdańsk

Subject card

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| 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<br>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-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-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<br>[SU5] implementation of a problem task |
| [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.

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|---|---|---|
| | Supplementary literature | Lisicki A., 1996, Pływy na morza i oceanach, GTN, 129s.<br><br>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.<br><br>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.<br><br>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<br><br>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?<br><br>5. Calculate the average height and period of the wave for the given conditions.<br><br>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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