University of Gdańsk

Subject card

Subject name and code	Introduction to Sea Dynamics - lecture, PG_00205342		
Field of study	Oceanography		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2028/2029
Education level	Bachelor's studies	Subject group	Obligatory subject group in the field of study Optional subject group 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	3	Language of instruction	Polish
Semester of study	5	ECTS credits	3.0
Learning profile	academic	Assessment form	exam
Conducting unit	Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector		
Name and surname of lecturer (lecturers)	Subject supervisor	dr Jordan Badur	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	35.0	0.0	0.0	0.0	0.0	35

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	35	3.0	37.0	75

Subject objectives

- Introduction of students to marine wave phenomena, ocean currents, and tides.
- Explanation to students of the basics of ocean dynamics in an analytical approach.
- Preparation of students for continuation of the subject in more advanced courses on ocean dynamics.
- Preparation of students for practical solving of basic problems related to contemporary ocean dynamics.

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	Is ready to exercise caution and skepticism when receiving information from scientific literature, the internet, and other media related to natural sciences.	[SK4] test/exam - oral or written
[OCEANL3-W05] has an advanced knowledge of techniques, research methods, and tools (mathematical, statistical, and computational) used by oceanographers to describe and interpret processes and phenomena occurring in the marine environment	Has advanced knowledge of techniques, research methods, and tools (mathematical, statistical, computational) used in the work of an oceanographer for describing and interpreting processes and phenomena occurring in the marine environment.	[SW4] test/exam - oral or written
[OCEANL3-W04] has an advanced understanding of issues and research problems in oceanography, and recognizes their connection with other scientific disciplines	Has an advanced understanding of issues and research problems in the field of marine dynamics, recognizing their connection to other scientific disciplines.	[SW4] test/exam - oral or written
[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)	Has an advanced understanding of and familiarity with terminology used in describing marine dynamics and related natural and exact sciences (in Polish and English).	[SW4] test/exam - oral or written
[OCEANL3-U12] is able to systematically expand and update oceanographic knowledge and enhance professional qualifications	Is able to systematically expand and update knowledge in the field of hydrodynamics and enhance professional qualifications.	[SU4] test/exam - oral or written
[OCEANL3-U01] is able to use the current scientific terminology in the field of oceanography in various forms of expression	Understands basic hydrodynamic processes in the sea and discusses them using appropriate terminology in this field.	[SU4] test/exam - oral or written
[OCEANL3-U05] is able to use general-purpose and specialized software, as well as mathematical and statistical methods, in data analysis and the presentation of results	Is able to apply mathematical and statistical methods in data analysis and presentation of results.	[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	Understands basic hydrodynamic processes in the sea and is prepared to deepen knowledge in this area.	[SK4] test/exam - oral or written

Subject contents

- Fundamentals of fluid kinematics, description of fluid particle motion in Lagrangian and Eulerian frameworks.
- Forces acting on moving fluid elements.
- Basic equations of fluid dynamics conservation equations of mass and momentum.
- Laminar and turbulent flow Reynolds equations, Boussinesq approximation.
- Hydrostatic and hydrodynamic stability of water masses.
- Energy exchange between the ocean and atmosphere.
- Currents in homogeneous and non-homogeneous water bodies Ekman model, baroclinic interaction effect, density currents fundamentals.
- Large-scale circulation of water masses in oceans western intensification, velocity field divergence, upwelling and downwelling, geostrophic currents fundamentals.
- Wind-driven currents.
- Basic equations and simplifications for regular waves.
- Waves sinusoidal, Stokes, cnoidal, solitary waves.
- Refraction, transformation, and breaking of waves in the coastal zone fundamentals. Long waves Kelvin, Rossby, seiches, tides basic concepts. Statistical characteristics of wind waves.
- Processes of wave generation, propagation, and decay basic concepts.
- Methods of wave forecasting.
- Internal waves in a two-layered medium basic concepts.

Prerequisites and co-requisites

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Exam	51.0%	100.0%

Recommended reading	Basic literature	• Druet C., 2000, Dynamika morza, Wyd. UG, Gdańsk • Mellor G.L., 1996, Introduction to physical oceanography, Wyd. AIP Press
	Supplementary literature	• Massel S.R., 2010, Procesy hydrodynamiczne w ekosystemach morskich, Wyd. UG, Gdańsk • Lisicki A., 1996, Pływy na morzach i oceanach, Wyd. GTN, Gdańsk • Massel S., 1992, Poradnik hydrotechnika, Wyd. Morskie, Gdańsk • Druet C., 1994, Dynamika stratyfikowanego oceanu, Wyd. PWN, Warszawa • Druet C., 1995, Elementy hydrodynamiki geofizycznej, Wyd. PWN, Warszawa
	eResources addresses	
Example issues/ example questions/ tasks being completed	Describe methods for forecasting wind waves.	
Work placement	Not applicable	

Document generated electronically. Does not require a seal or signature.