University of Gdańsk

Subject card

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| Subject name and code | Introduction to sea dynamics - lecture, PG_00159315 | | |
| Field of study | Oceanography | | |
| Date of commencement of studies | October 2024 | Academic year of realisation of subject | 2026/2027 |
| Education level | Bachelor's studies | Subject group | Obligatory subject group in the field of study<br>Optional subject group<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 | 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 | dr Jordan Badur | |

**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

eNauczanie source addresses:

Moodle ID: 13916 ATC-WOiG-OCEAN-L3DZ-(2026/2027) Wprowadzenie do Dynamiki morza https://mdl.ug.edu.pl/course/view.php?id=13916

**Learning activity and number of study hours**

| Learning activity | Participation in didactic classes included in study plan | Participation in consultation hours | Self-study | SUM |
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| Number of study hours | 35 | 10.0 | 30.0 | 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-K04] is ready 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. | [SK1] oral statement/conversation/ discussion<br>[SK2] presentation/project/paper/ report<br>[SK3] text preparation/written work<br>[SK4] test/exam - oral or written<br>[SK5] implementation of a problem task<br>[SK8] observation of student's independent or team 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) | 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<br>[SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report<br>[SW3] text preparation/written work<br>[SW5] implementation of a problem task |
| [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<br>[SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report<br>[SW3] text preparation/written work<br>[SW5] implementation of a problem task |
| [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. | [SU1] oral statement/conversation/ discussion<br>[SU2] presentation/project/paper/ report<br>[SU3] text preparation/written work<br>[SU4] test/exam - oral or written<br>[SU5] implementation of a problem task<br>[SU8] observation of student's independent or team work |
| [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. | [SU1] oral statement/conversation/ discussion<br>[SU2] presentation/project/paper/ report<br>[SU3] text preparation/written work<br>[SU4] test/exam - oral or written<br>[SU5] implementation of a problem task<br>[SU8] observation of student's independent or team work |
| [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. | [SK1] oral statement/conversation/ discussion<br>[SK2] presentation/project/paper/ report<br>[SK3] text preparation/written work<br>[SK4] test/exam - oral or written<br>[SK5] implementation of a problem task<br>[SK8] observation of student's independent or team work |
| [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<br>[SW1] oral statement/ conversation/discussion<br>[SW2] presentation/project/paper/ report<br>[SW3] text preparation/written work<br>[SW5] implementation of a problem task |
| [OCEANL3-U12] is able to systematically expand and update oceanographic knowledge and improve professional qualifications | Is able to systematically expand and update knowledge in the field of hydrodynamics and enhance professional qualifications. | [SU1] oral statement/conversation/ discussion<br>[SU2] presentation/project/paper/ report<br>[SU3] text preparation/written work<br>[SU4] test/exam - oral or written<br>[SU5] implementation of a problem task<br>[SU8] observation of student's independent or team work |

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| Subject contents | • Fundamentals of fluid kinematics, description of fluid particle motion in Lagrangian and Eulerian frameworks.<br>• Forces acting on moving fluid elements.<br>• Basic equations of fluid dynamics conservation equations of mass and momentum.<br>• Laminar and turbulent flow Reynolds equations, Boussinesq approximation.<br>• Hydrostatic and hydrodynamic stability of water masses.<br>• Energy exchange between the ocean and atmosphere.<br>• Currents in homogeneous and non-homogeneous water bodies Ekman model, baroclinic interaction effect, density currents fundamentals.<br>• Large-scale circulation of water masses in oceans western intensification, velocity field divergence, upwelling and downwelling, geostrophic currents fundamentals.<br>• Wind-driven currents.<br>• Basic equations and simplifications for regular waves.<br>• Waves sinusoidal, Stokes, cnoidal, solitary waves.<br>• Refraction, transformation, and breaking of waves in the coastal zone fundamentals. Long waves Kelvin, Rossby, seiches, tides basic concepts. Statistical characteristics of wind waves.<br>• Processes of wave generation, propagation, and decay basic concepts.<br>• Methods of wave forecasting.<br>• 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 |
|---|---|---|
| Presentation / oral report | 51.0% | 50.0% |
| Egzam | 51.0% | 50.0% |

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| Recommended reading | Basic literature | • Druet C., 2000, Dynamika morza, Wyd. UG, Gdańsk<br>• 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<br>• Lisicki A., 1996, Pływy na morzach i oceanach, Wyd. GTN, Gdańsk<br>• Massel S., 1992, Poradnik hydrotechnika, Wyd. Morskie, Gdańsk<br>• Druet C., 1994, Dynamika stratyfikowanego oceanu, Wyd. PWN, Warszawa<br>• 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 | |

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