

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |                                                          |                                         |                                     |                                                                                                                      |            |     |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------|-----|
| Subject name and code                       | Physics for oceanographers - lecture, PG_00103325                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Field of study                              | Oceanography                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Date of commencement of studies             | October 2025                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          | Academic year of realisation of subject |                                     | 2025/2026                                                                                                            |            |     |
| 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                               | 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | Language of instruction                 |                                     | Polish                                                                                                               |            |     |
| Semester of study                           | 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | ECTS credits                            |                                     | 4.0                                                                                                                  |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          | Assessment form                         |                                     | exam                                                                                                                 |            |     |
| 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 Wojciech Brodziński                  |                                     |                                                                                                                      |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                          |                                         |                                     |                                                                                                                      |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                                              | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 40.0                                                     | 0.0                                     | 0.0                                 | 0.0                                                                                                                  | 0.0        | 40  |
|                                             | E-learning hours included: 0.0                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                          |                                         |                                     |                                                                                                                      |            |     |
|                                             | Additional information:<br>If necessary, up to 6 hours of classes can be conducted remotely.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                                          |                                         |                                     |                                                                                                                      |            |     |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 40                                                       |                                         | 10.0                                |                                                                                                                      | 50.0       | 100 |
| Subject objectives                          | <p>1. Familiarizing students with basic physical phenomena and processes, the laws governing them and methods of their research.</p> <p>2. Providing knowledge and developing skills necessary to:</p> <p>- using the methods of higher mathematics to describe physical phenomena and the physical interpretation of the obtained mathematical solutions;</p> <p>- carrying out observations of physical phenomena; collecting, analyzing and interpreting data.</p> <p>3. Development of creative thinking skills.</p> <p>4. Creating a basis for the effective use of subsequent courses on marine physics and other areas of oceanography.</p> |                                                          |                                         |                                     |                                                                                                                      |            |     |

|                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
|----------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Learning outcomes                                              | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Method of verification                                                                |
|                                                                | OCEANL3-W02                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | K_W02 - Understands and correctly describes the basic physical phenomena occurring in nature, including the marine environment, and the laws governing them                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | [SW4] test/exam - oral or written<br>[SW1] oral statement/<br>conversation/discussion |
|                                                                | OCEANL3-U04                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | K_U04 - Is able to independently search for information in Polish and English-language specialized literature, as well as on the Internet within the scope of the subject.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | [SU4] test/exam - oral or written                                                     |
|                                                                | OCEANL3-W01                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | K_W01 - Knows and understands the terminology used in physics at an advanced level                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | [SW4] test/exam - oral or written<br>[SW1] oral statement/<br>conversation/discussion |
| Subject contents                                               | <p>A.1 Motion of a material point: Characteristics of motion. Uniform linear motion. Non-uniform linear motion. Motion on a plane. Circular motion. Relativity of motion.</p> <p>A.2 Dynamics: Force. Newton's 1st - 3rd principles of dynamics. Types of forces in nature. Inertial and non-inertial reference frames, inertial forces. Momentum. Principle of conservation of momentum. Work. Conservative and non-conservative forces. Mechanical energy. Principle of conservation of mechanical energy.</p> <p>A.3 Mechanical oscillations: Parameters describing harmonic oscillations. Equation of vibrations of a harmonic oscillator. Energy in oscillating motion. Free, damped and forced oscillations. Resonance phenomena.</p> <p>A.4 Waves: Definition of a wave. Classification of waves. Parameters characterizing a wave. Wave phenomena.</p> <p>A.5 Electricity and magnetism (selected elements). Electromagnetic waves. Spectrum of electromagnetic radiation.</p> <p>A.6 Corpuscular-wave nature of light.</p> <p>A.7 Thermodynamics: Basic concepts: temperature, heat. Mechanisms of heat exchange. The first law of thermodynamics. Ideal gas and its transformations.</p> <p>A.8 Elements of fluid statics: hydrostatic pressure, Pascal's law, buoyancy force, Archimedes' law.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Prerequisites and co-requisites                                | Knowledge of the basics of higher mathematics. The prerequisite for taking the exam is a passing grade in the auditory and laboratory exercises in Physics for oceanographers.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Assessment methods and criteria                                | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Passing threshold                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Percentage of the final grade                                                         |
|                                                                | Final exam                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 51.0%                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 100.0%                                                                                |
| Recommended reading                                            | Basic literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 1. Samuel J. Ling, William Moebs , Jeff Sanny, 2018, Fizyka dla szkół wyższych, OpenStax Polska<br>2. Stanisław R. Massel, 2010. Procesy hydrodynamiczne w ekosystemach morskich. Wydawnictwo Uniwersytetu Gdańskiego.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                       |
|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 1. Jearl Walker, 2011. Podstawy fizyki. Zbiór zadań. Wydawnictwo: Naukowe PWN.<br>2. Paul G. Hewitt, 2010. Fizyka wokół nas Wydawnictwo Naukowe PWN.<br>3. David Halliday, Robert Resnick, Jearl Walker, 2007. Podstawy fizyki - tom 1. Mechanika. Wydawnictwo Naukowe PWN.<br>4. David Halliday, Robert Resnick, Jearl Walker, 2007. Podstawy fizyki - tom 2. Mechanika, drgania i fale, termodynamika. Wydawnictwo Naukowe PWN.<br>5. David Halliday, Robert Resnick, Jearl Walker, 2007. Podstawy fizyki - tom 3. Elektryczność i magnetyzm. Wydawnictwo Naukowe PWN.<br>6. David Halliday, Robert Resnick, Jearl Walker, 2007. Podstawy fizyki - tom 4. Fale elektromagnetyczne, optyka i teoria względności. Wydawnictwo Naukowe PWN. |                                                                                       |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |
| Example issues/<br>example questions/<br>tasks being completed |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                       |

|                |                |
|----------------|----------------|
| Work placement | Not applicable |
|----------------|----------------|

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