

## Subject card

|                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                          |                                         |                                     |         |                                                                                                             |     |
|---------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------|-----------------------------------------|-------------------------------------|---------|-------------------------------------------------------------------------------------------------------------|-----|
| Subject name and code                       | Hydrophysics - lecture, PG_00186981                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                                                          |                                         |                                     |         |                                                                                                             |     |
| Field of study                              | Water Management and Protection of Water Resources                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          |                                         |                                     |         |                                                                                                             |     |
| Date of commencement of studies             | October 2026                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                          | Academic year of realisation of subject |                                     |         | 2026/2027                                                                                                   |     |
| Education level                             | Bachelor's studies                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          | Subject group                           |                                     |         | Obligatory subject group in the field of study<br>Subject group related to practical vocational preparation |     |
| 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                            |                                     |         | 3.0                                                                                                         |     |
| Learning profile                            | practical                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |                                                          | Assessment form                         |                                     |         | exam                                                                                                        |     |
| Conducting unit                             | Department of Geophysics -> Faculty of Oceanography and Geography -> Rector                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                          |                                         |                                     |         |                                                                                                             |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                          | dr hab. Marcin Paszkuta                 |                                     |         |                                                                                                             |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                         |                                     |         |                                                                                                             |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Lecture                                                  | Tutorial                                | Laboratory                          | Project | Seminar                                                                                                     | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 30.0                                                     | 0.0                                     | 0.0                                 | 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                                 |         | 43.0                                                                                                        | 75  |
| Subject objectives                          | 1. To familiarise students with the basic physical phenomena and processes, the laws governing them and the methods of studying them.<br>2. To learn and understand the basic laws responsible for the physical phenomena occurring in the hydrosphere.<br>3. To provide the knowledge and skills necessary to<br>- use mathematical tools to describe physical phenomena;<br>- make, analyse and interpret observations of nature.<br>4. To lay the foundations for the effective study of other courses. |                                                          |                                         |                                     |         |                                                                                                             |     |

| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Subject outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Method of verification                                                              |
|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
|                                 | [GWOZW3-W01] The student knows and understands in advanced basic biological, physical and chemical processes and phenomena, as well as analyzes their mutual relations and course in relation to natural environment and socio-ecological systems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | K_W04 - Knows basic statistical tools to interpret data concerning phenomena and processes observed during laboratory experiments (concerning content - point B3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [SW4] test/exam - oral or written                                                   |
|                                 | [GWOZW3-U12] The student can formulate opinions on a selected topic and prepare small studies in foreign language.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | The student is able to formulate opinions on a selected topic and prepare small studies in English.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | [SU1] oral statement/conversation/discussion                                        |
|                                 | [GWOZW3-W08] The student has an advanced knowledge and understanding of the key concepts and issues within their field of study in English.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Knows and is able to use basic concepts related to the field of study in English.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | [SW1] oral statement/conversation/discussion<br>[SW3] text preparation/written work |
|                                 | [GWOZW3-W04] The student is familiar with advanced research techniques, methods and tools currently used in water management and the protection of water resources, in both the natural and social sciences, including advanced statistical and IT tools enabling the description, modelling and interpretation of data concerning phenomena and processes occurring in the aquatic environment, as well as tools for describing relationships within socio-ecological systems.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | K_W01 - Knows and understands at an advanced level basic processes and phenomena of the physical processes and phenomena in the aquatic environment (concerning content - points A1, B1 and B3)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | [SW4] test/exam - oral or written                                                   |
| Subject contents                | <p>A. Problems of the lecture</p> <p>A.1 Part 1 Fundamentals of Physics (15 hours)</p> <p>A.1.1 Motion of a material point: Characteristics of motion. Uniform and non-uniform rectilinear motion. Curvilinear motion by example of motion on a circle. Relativity of motion.</p> <p>A.1.2 Dynamics: Force. Newton's 1st - 3rd principles of dynamics. Types of forces in nature. Work. Conservative and non-conservative forces. Energy</p> <p>Mechanical energy. Principle of conservation of energy.</p> <p>A.1.3 Mechanical oscillation: Dynamics of oscillation (equilibrium state, energy changes). Parameters describing oscillations of an oscillator. Natural and forced. Resonance phenomena.</p> <p>A.1.4 Waves: Definition of a wave. Classification of waves. Parameters characterising a wave. Wave phenomena. Energy transmitted by waves.</p> <p>A. 1.5 Thermodynamics: Basic concepts. Main principles of thermodynamics.</p> <p>A.2 Part 2 Physical phenomena in the hydrosphere (15 hours)</p> <p>A.2.1 Forces acting on ocean water masses, equilibrium and types of movement of water masses.</p> <p>A.2.2 Seawater, its molecular structure and physical properties.</p> <p>A.2.3 Inflow of solar energy and interaction of light with the aquatic environment.</p> <p>A.2.4 Molecular and turbulent exchange of mass, heat and momentum in water bodies.</p> |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                     |
| 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                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ol style="list-style-type: none"> <li>1. Halliday D., Resnick R., Walker J., 2007. Podstawy fizyki - tom 1. Mechanika, PWN, Warszawa.</li> <li>2. Halliday D., Resnick R., Walker J., 2007. Podstawy fizyki - tom 2. Mechanika, drgania i fale, termodynamika, PWN, Warszawa.</li> <li>3. Halliday D., Resnick R., Walker J., 2007. Podstawy fizyki - tom 3. Elektryczność i magnetyzm. PWN, Warszawa.</li> <li>4. Halliday D., Resnick R., Walker J., 2007. Podstawy fizyki - tom 4. Fale elektromagnetyczne, optyka i teoria względności, PWN, Warszawa.</li> <li>5. Halliday D., Resnick R., Walker J., 2007. Podstawy fizyki - tom 5. Fizyka współczesna, PWN, Warszawa.</li> <li>6. Orear J., 2008. Fizyka, tomy 1, 2., WNT, Warszawa.</li> <li>7. Dera J., 2003. Fizyka morza, PWN, Warszawa.</li> <li>8. Massel S.R., 2010. Procesy hydrodynamiczne w ekosystemach morskich. Wydawnictwo Uniwersytetu Gdańskiego.</li> </ol> |                                                                                     |

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|                                                                | Supplementary literature                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | 1. Hewitt P.G., 2010. Fizyka wokół nas, PWN, Warszawa.<br>2. Resnick R., Halliday D., 1999. Fizyka (części 1, 2), PWN, Warszawa.<br>3. Born M., Wolf E., 1988. Principles of Optics. Pergamon Press, London. |
|                                                                | eResources addresses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                              |
| Example issues/<br>example questions/<br>tasks being completed | A. Problems of the lecture<br>A.1 Part 1 Fundamentals of Physics (15 hours)<br>A.1.1 Motion of a material point: Characteristics of motion. Uniform and non-uniform rectilinear motion. Curvilinear motion by example of motion on a circle. Relativity of motion.<br>A.1.2 Dynamics: Force. Newton's 1st - 3rd principles of dynamics. Types of forces in nature. Work. Conservative and non-conservative forces. Energy<br>Mechanical energy. Principle of conservation of energy.<br>A.1.3 Mechanical oscillation: Dynamics of oscillation (equilibrium state, energy changes). Parameters describing oscillations of an oscillator. Natural and forced. Resonance phenomena.<br>A.1.4 Waves: Definition of a wave. Classification of waves. Parameters characterising a wave. Wave phenomena. Energy transmitted by waves.<br>A. 1.5 Thermodynamics: Basic concepts. Main principles of thermodynamics.<br>A.2 Part 2 Physical phenomena in the hydrosphere (15 hours)<br>A.2.1 Forces acting on ocean water masses, equilibrium and types of movement of water masses.<br>A.2.2 Seawater, its molecular structure and physical properties.<br>A.2.3 Inflow of solar energy and interaction of light with the aquatic environment.<br>A.2.4 Molecular and turbulent exchange of mass, heat and momentum in water bodies. |                                                                                                                                                                                                              |
| Work placement                                                 | Not applicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                              |

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