

## Subject card

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| Subject name and code                       | Fundamentals of Sea Ecology, PG_00154364                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                         |                                     |                                                                                              |            |     |
| Field of study                              | Natural Resources Conservation                                                                                                                                                                                                                                                                                                                                                                             |                                                          |                                         |                                     |                                                                                              |            |     |
| Date of commencement of studies             | October 2024                                                                                                                                                                                                                                                                                                                                                                                               |                                                          | Academic year of realisation of subject |                                     | 2026/2027                                                                                    |            |     |
| Education level                             | undergraduate studies                                                                                                                                                                                                                                                                                                                                                                                      |                                                          | Subject group                           |                                     | Optional subject group<br>Subject group related to scientific research in the field of study |            |     |
| Mode of study                               | full-time studies                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Mode of delivery                        |                                     | at the university                                                                            |            |     |
| Year of study                               | 3                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | Language of instruction                 |                                     | Polish                                                                                       |            |     |
| Semester of study                           | 5                                                                                                                                                                                                                                                                                                                                                                                                          |                                                          | ECTS credits                            |                                     | 1.0                                                                                          |            |     |
| Learning profile                            | academic                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          | Assessment form                         |                                     |                                                                                              |            |     |
| Conducting unit                             | Pracownia Biosystematyki i Ekologii Bezkręgowców Wodnych -> Katedra Genetyki Ewolucyjnej i Biosystematyki -> Faculty of Biology                                                                                                                                                                                                                                                                            |                                                          |                                         |                                     |                                                                                              |            |     |
| Name and surname of lecturer (lecturers)    | Subject supervisor                                                                                                                                                                                                                                                                                                                                                                                         |                                                          | dr hab. Anna Iglowska                   |                                     |                                                                                              |            |     |
|                                             | Teachers                                                                                                                                                                                                                                                                                                                                                                                                   |                                                          |                                         |                                     |                                                                                              |            |     |
| Lesson types                                | Lesson type                                                                                                                                                                                                                                                                                                                                                                                                | Lecture                                                  | Tutorial                                | Laboratory                          | Project                                                                                      | Seminar    | SUM |
|                                             | Number of study hours                                                                                                                                                                                                                                                                                                                                                                                      | 0.0                                                      | 15.0                                    | 0.0                                 | 0.0                                                                                          | 0.0        | 15  |
|                                             | 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                                                                                                                                                                                                                                                                                                                                                                                      | 15                                                       |                                         | 2.0                                 |                                                                                              | 8.0        | 25  |
| Subject objectives                          | <div>- providing basic knowledge on the functioning of marine ecosystems</div> <div>- understanding the mechanisms shaping selected ecological processes in seas and oceans</div> <div>- presenting the current state of knowledge regarding ecological problems and threats in the marine environment</div> <div>- indicating the importance of protecting the marine environment and its resources</div> |                                                          |                                         |                                     |                                                                                              |            |     |

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| Learning outcomes               | Course outcome                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Subject outcome                                                                                                                                                                                                                 | Method of verification                                                                                                                         |
|                                 | [OZPL3_W11] The graduate possesses a fundamental understanding of the concepts and terminology of natural science, as well as knowledge of the evolution of natural sciences and the research methods employed in them. They are also cognizant of the potential for practical application                                                                                                                                                                                                                                                                                                                                                                                                                      | - characterizes individual ecosystems within the marine environment and notices the differences between them (O_W11);<br>- explains and understands the mechanisms of selected ecological processes in seas and oceans (O_W11); | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion<br>[SW3] text preparation/written work                       |
|                                 | [OZPL3_U07] The graduate is able to draw correct conclusions on the basis of analysis and synthesis of data from various sources                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - interprets information about ecological changes in the marine environment and predicts their consequences for society (O_U07);                                                                                                | [SU1] oral statement/conversation/discussion<br>[SU4] test/exam - oral or written<br>[SU8] observation of student's independent or team work   |
|                                 | [OZPL3_K08] The graduate is ready to systematically update his/her natural knowledge and to apply it in practice                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | - is able to conduct a critical discussion on the presented program content (O_K08);<br>- understands the need to promote pro-ecological attitudes and behaviours (O_K08);                                                      | [SK1] oral statement/conversation/discussion<br>[SK8] observation of student's independent or team work                                        |
|                                 | [OZPL3_W09] The graduate possesses an advanced comprehension of the current state of knowledge and the latest trends in biology, as well as their relationship to other natural disciplines                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | - updates knowledge regarding current ecological problems and expected changes in the marine environment (O_W09)                                                                                                                | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion                                                              |
|                                 | [OZPL3_K05] The graduate is ready to understand the need to improve their own competences, update their knowledge and improve their skills                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | - feels the need to update knowledge on ecological problems of seas and oceans (O_K05);<br>- notices the connection between the sustainable exploitation of marine resources and stability of the ecosystem (O_K05);            | [SK1] oral statement/conversation/discussion<br>[SK8] observation of student's independent or team work                                        |
|                                 | [OZPL3_W07] The graduate has an advanced understanding of the methods and means of nature and environmental protection, including nature monitoring                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | - lists and describes procedures related to the protection of the marine environment and its resources (O_W07);                                                                                                                 | [SW4] test/exam - oral or written<br>[SW1] oral statement/conversation/discussion<br>[SW2] presentation/project/paper/report                   |
| Assessment methods and criteria | [OZPL3_U02] The graduate can read with comprehension scientific texts in the field of natural sciences in Polish and simple texts in English                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | - reads and understands scientific texts on ecology of seas and oceans in Polish and simple texts in English (O_U02);                                                                                                           | [SU1] oral statement/conversation/discussion<br>[SU3] text preparation/written work<br>[SU8] observation of student's independent or team work |
|                                 | Subject contents                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                                                                                                                                                                                                                 |                                                                                                                                                |
|                                 | 1. General characteristics of the marine environment. 2. Abiotic factors shaping the marine environment. Ocean Circulation. 3. Cycle of elements in the marine environment. 4. Primary and secondary production. 5. Characteristics of ecological zones of the oceans (estuaries, shelf, continental slope, pelagic and deep ocean floor). 6. Bottom sediments and benthic environment. 7. Ecology of the seas of the polar regions. 8. The impact of climate change and increased CO <sub>2</sub> emissions on the marine environment. 9. Pollution of seawater. The problem of microplastics. 10. Protection of the marine environment. 11. Marine environment and society. Exploitation of marine resources. |                                                                                                                                                                                                                                 |                                                                                                                                                |
|                                 | Prerequisites and co-requisites                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                 |                                                                                                                                                |
|                                 | To complete this course, it is necessary to pass following courses: Invertebrate Zoology, Plant and Animal Ecology.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                 |                                                                                                                                                |
|                                 | Subject passing criteria                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Passing threshold                                                                                                                                                                                                               | Percentage of the final grade                                                                                                                  |
|                                 | work card                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 51.0%                                                                                                                                                                                                                           | 10.0%                                                                                                                                          |
|                                 | final test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | 51.0%                                                                                                                                                                                                                           | 50.0%                                                                                                                                          |
|                                 | essay                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 51.0%                                                                                                                                                                                                                           | 10.0%                                                                                                                                          |
|                                 | presentation (speech)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 51.0%                                                                                                                                                                                                                           | 10.0%                                                                                                                                          |
|                                 | test                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 51.0%                                                                                                                                                                                                                           | 20.0%                                                                                                                                          |

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| Recommended reading | Basic literature         | <p>Literature required to complete the course (pass the exam):</p> <ol style="list-style-type: none"> <li>1. Wolnomiejski, N., Pawlikowski, T. 2006. Zarys ekologii i ochrony mórz. Część 1. Wydawnictwo Naukowe Uniwersytetu Mikołaja Kopernika.</li> <li>2. Bolałek, J. 2016. Ochrona środowiska morskiego od teorii do praktyki. Wydawnictwo Uniwersytetu Gdańskiego.</li> <li>3. Różańska, Z. 1999. Ekologia środowiska morskiego. Wydawnictwo ART.</li> <li>4. Kaiser, M.J., Attrill, M.J., Jennings, S., Thomas, D. 2020. Marine Ecology Processes, Systems, and Impacts. Oxford University Press.</li> <li>5. Duxbury, A.C., Duxbury, A.B., Sverdrup, K.A. 2002. Oceany Świata. Wydawnictwo PWN, Warszawa.</li> <li>6. Selected scientific papers shared with students during the classes.</li> </ol> |
|                     | Supplementary literature | <p>Additional literature:</p> <p>Iglikowska, A., Borszcz, T., Drewnik, A., Grabowska, M., Humphreys-Williams, E., Kędra, M., Krzemińska, M., Piwoni-Piórewicz, A., Kukliński, P. 2018. Mg and Sr in Arctic echinoderm calcite: Nature or nurture?. Journal of Marine Systems 180: 279-288</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|                     | eResources addresses     | <p>Uzupełniające</p> <p>Adresy na platformie eNauczanie:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

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| <p>Example issues/<br/>example questions/<br/>tasks being completed</p> | <p>Task 1. Which of the following factors and processes are influenced by the global transmission belt:</p> <ul style="list-style-type: none"> <li>a) Climate formation</li> <li>b) Exchange of thermal and mechanical energy</li> <li>c) Distribution of marine plant and animal species</li> <li>d) Supply of nutrients that stimulate the development of phytoplankton</li> <li>e) All of the above.</li> </ul> <p>Task 2. Thermocline is:</p> <ul style="list-style-type: none"> <li>a) a layer of rapid change of density or potential density of water in seas and oceans</li> <li>b) a transitional layer of water in sea or ocean between less salty water above it and more salty below it. It is characterized by a large vertical salinity gradient</li> <li>c) a layer of water in which the temperature changes rapidly with increasing depth.</li> </ul> <p>Task 3. Explain what the bioluminescence is:</p> <p>.....</p> |
| <p>Work placement</p>                                                   | <p>Not applicable</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |

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