University of Gdańsk

Subject card

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| Subject name and code | Geoinformation for Physical Oceanography - laboratory, PG_00206207 | | | | | | |
| Field of study | Oceanography | | | | | | |
| Date of commencement of studies | October 2026 | | Academic year of realisation of subject | 2026/2027 | | | |
| Education level | Master's studies | | Subject group | Obligatory subject group in the field of study<br>Optional subject group | | | |
| Mode of study | full-time studies | | Mode of delivery | at the university | | | |
| Year of study | 1 | | Language of instruction | Polish | | | |
| Semester of study | 1 | | ECTS credits | 3.0 | | | |
| Learning profile | academic | | Assessment form | credit | | | |
| Conducting unit | Geographic Information System (GIS) Laboratory -> Faculty of Oceanography and Geography -> Rector | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Maciej Markowski | | | | | |
| | Teachers | | | | | | |
| Lesson types | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 0.0 | 0.0 | 45.0 | 0.0 | 0.0 | 45 |
| | 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 | 45 | | 2.0 | 28.0 | 75 | |
| Subject objectives | The aim of the course is to provide students with theoretical knowledge and practical skills in the application of Geographic Information Systems (GIS) in physical oceanography. Students will learn about sources of oceanographic data, methods for their processing, and the integration of raster, vector, and spatio-temporal datasets. The course enables understanding of spatial analysis and modeling of ocean processes in GIS, as well as the use of remote sensing and digital models in marine and coastal environment studies. As a result, students will be able to prepare and present GIS analysis results in the form of maps, visualizations, and scientific reports. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [OCEANMU2-K01] is ready to plan, implement and supervise, individually or collectively, next stages of the entrusted task, is ready to take responsibility for its results; | is ready to plan, implement and supervise subsequent stages of the performed analyses, is ready to take responsibility for their results | [SK4] test/exam - oral or written<br>[SK5] implementation of a problem task |
| [OCEANMU2-U11] is able to work individually and cooperate in laboratory and field groups, performs various functions in them, including managerial ones, performs various assigned tasks | is able to work individually on data analysis and cooperate in laboratory group, performs various functions in them, including managerial ones, performs various assigned tasks | [SU4] test/exam - oral or written<br>[SU5] implementation of a problem task |
| [OCEANMU2-U06] is able to use specialized computer software as well as advanced mathematical and statistical methods to analyze data and describe processes and phenomena occurring in the marine and coastal environment; evaluates their reliability and usefulness and performs critical analysis | is able to use arcGISPro to analyse physical processes and phenomena in marine environment and coastal zone | [SU4] test/exam - oral or written<br>[SU5] implementation of a problem task |
| [OCEANMU2-W03] has an in-depth understanding of research methods used in oceanography and related sciences, and interprets their mechanisms and interrelationships across different spatial and temporal scales | knows and understands, in-depth, GIS methods used in physical oceanography | [SW4] test/exam - oral or written |
| [OCEANMU2-U01] is able to formulate and solve complex and unusual problems regarding the functioning of individual components of the marine environment using knowledge from various fields and scientific disciplines and propose solutions | is able to formulate and solve complex and unusual problems in physical oceanography using various data sets and GIS techniques | [SU5] implementation of a problem task |
| [OCEANMU2-K03] is ready to effectively organize his/her own work, is active and persistent and punctuality in completing tasks, is ready to carrying out evaluation of their own activities | is ready to effectively organize his/her own work on data analysis, is active and persistent and punctual in completing tasks, is ready to evaluate their own activities | [SK5] implementation of a problem task |

## Subject contents

1. Introduction to GIS Work Environment and Data Structure
2. Sources of Oceanographic Data and Preliminary Processing
3. Map Projections and Coordinate Systems in Marine Analyses
4. Concept and Creation of a Geodatabase for Oceanographic Studies
5. Advanced Techniques for Symbolization and Labeling of Oceanographic Data
6. Remote Sensing in Physical Oceanography
7. Digital Elevation Models (DEM) and Digital Surface Models (DSM) in Coastal Analyses Case Study
8. Vector Analysis and Modeling in Marine Environmental Studies
9. Raster Analysis and Modeling in Oceanographic Research
10. Advanced Integration of Spatio-Temporal Data in Oceanography
11. Modeling Dynamic Ocean Processes and Simulations in GIS
12. Presentation and Publication of GIS Analysis Results

## Prerequisites and co-requisites

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| evaluation of solutions and implementations of problem-based tasks | 51.0% | 60.0% |
| final written examination | 51.0% | 40.0% |

## Recommended reading

Basic literature

- Dawn J. Wright, 2015, Ocean Solutions, Earth Solutions, second edition, ESRI Press.
- Urbański J., 2008, GIS w badaniach przyrodniczych, UG, Gdańsk.
- Davis D., 2004, GIS dla każdego, Wydawnictwo Mikom, Warszawa.
- Medyńska-Gulij B., 2024, Kartografia - geomatycznie i geomedialnie, PWN.

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| | Supplementary literature | • Tomlinson R., Thinking about GIS, 2013, Esri Press.<br>• Longley P.A., Goodchild M.F., Rhind D.W., 2008, GIS. Teoria i praktyka, PWN, Warszawa.<br>• Markowski M., Golus W., Kwidzińska M., 2015, Aplikacyjność metod oceny wielkości opadów zasilających oczka Pomorza Gdańskiego [w:] D. Absalon, M. Matysik, M. Ruman [red.]<br>• Breman J., 2002, Marine Geography: GIS for the Oceans and Seas. ESRI Press.<br>• Vasilis D. Valavanis, 2002, Geographic Information Systems in Oceanography and Fisheries. Taylor & Francis CRC Press. |
| | eResources addresses | |
| Example issues/ example questions/ tasks being completed | 1. Which remote sensing techniques are most commonly used in oceanographic research, and what types of data analyses are they suitable for?<br>2. How is a geodatabase created and managed for an oceanographic project to facilitate the integration of raster and vector data?<br>3. How can digital terrain and surface models be used in coastal analyses? | |
| Work placement | Not applicable | |

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