University of Gdańsk

Subject card

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|---|---|---|---|
| Subject name and code | Statistical inference (Laboratury classes), PG_00201211 | | |
| Field of study | Physical geography and geoinformation | | |
| 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 |
| 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 | 2.0 |
| Learning profile | academic | Assessment form | credit |
| Conducting unit | Climate Research Laboratory -> Department of Physical Oceanography and Climate Research -> Faculty of Oceanography and Geography -> Rector | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | dr Janusz Filipiak | |
| | Teachers | | |

**Lesson types**

| Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|
| Number of study hours | 0.0 | 0.0 | 30.0 | 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 | 4.0 | 16.0 | 50 |

**Subject objectives**

1. Familiarization with the methods of statistical inference.

2. Developmnet of the ability to apply statistical methods in practice with particular emphasis on problems in the study of physical geography.

3. Learning and practical use of R programming language in statistical inference analyses.

| Learning outcomes | Course outcome | Subject outcome | Method of verification |
|---|---|---|---|
| | [GFGMU2_U04] is able to analyse and interpret the causes and course of physical-geographical processes and phenomena, selects and applies advanced research methods and tools, including statistical and geoinformatics methods, and critically interprets the results obtained, drawing conclusions and formulating their own position on that basis, justified in debate. | Student is able to describe and analyze the causes and course of climatological, hydrological and geomorphological processes and phenomena, skillfully selecting and applying advanced techniques and research tools from the field of statistical methods interpreting the results obtained as a consequence, and then using theoretical knowledge to formulate their own opinions and conclusions. | [SU3] text preparation/written work |
| | [GFGMU2_W02] knows and understands to a deepened extent issues in the field of exact sciences enabling the understanding of complex processes and phenomena occurring in the Earth's natural environment, and in their interpretations consistently relay on empirical foundations, using qualitative and quantitative methods | Student knows and understands the issues of science to understand the complex processes and phenomena of climatology, hydrology and geomorphology occurring in the Earth's natural environment, and in their interpretation consistently relies on empirical foundations, using qualitative and quantitative methods. | [SW3] text preparation/written work |
| | [GFGMU2_K03] is ready to accepting responsibility for group work assuming various roles in it, participating in preparation of scientific projects, taking responsibility for the equipment and safety rules, active developing of professional competences and knowledge in Earth and environmental sciences and geoinformation, including interdisciplinarity, as well as developing the principles of professional ethics, respecting copyright rules | Student is ready to assume responsibility for work in a group assuming various roles in it, participate in the preparation of scientific projects, is ready to actively expand professional competence and update knowledge in earth and environmental sciences and geoinformation, especially in climatology, hydrology and geomorphology enriching them with an interdisciplinary dimension, is ready to observe and develop the principles of professional ethics, including the observance of copyright in his own and others' activities. | [SK3] text preparation/written work<br>[SK8] observation of student's independent or team work |
| | [GFGMU2_K01] is ready to critically assess the knowledge obtained in the field of Earth and environmental sciences, particularly physical geography and geoinformation, its completion and verification through further critical analysis of scientific literature | Student is ready to critically assess his knowledge of the Earth and the environment and geo-information, especially in the areas of climatology, hydrology and geomorphology, and is ready to complete and verify knowledge and skills in the area indicated above through critical reading of the literature of the scope outlined above. | [SK3] text preparation/written work |
| | [GFGMU2_W04] knows and understands theoretical foundations of research methods used in physical geography and closely related sciences, descriptive and mathematical statistics, as well as in a deepened extent methods of analyzing spatial phenomena | Student knows and understands the theoretical basis of research methods used in physical geography, especially climatology, hydrology and geomorphology, as well as in closely related sciences, descriptive and mathematical statistics, and advanced methods of analyzing spatial phenomena. | [SW3] text preparation/written work |

<table>
<tr><td>Subject contents</td><td>1. The concept and types of random variable.<br><br>2. Basic types of distributions of random variables (continuous and discrete).<br><br>3. The concept of random sampling in mathematical statistics. Techniques of random sampling.<br><br>4. Statistical estimation: the concept and properties of estimators; estimators: mean, variance, proportion and their properties; the concept and essence of interval estimation; principles of construction of confidence intervals for mean and proportion.<br><br>5. Verification of statistical hypotheses: the concept and types of statistical hypotheses; null and alternative hypothesis; principles of construction of statistical tests; significance level vs. critical area - critical level p.<br><br>6. Parametric tests: how to formulate hypotheses and define the critical area; tests for mean, proportion, two means, two variances, two proportions.<br><br>7. Non-parametric tests: the essence of non-parametric tests; tests of randomness; tests of concordance; tests of homogeneity.<br><br>8. Tests in correlation and regression analysis: test for correlation coefficient and linear regression; linearity test of regression function; chi-square independence test.<br><br>9. Tests in time series analysis: test for directional coefficient of a straight line; linearity of trend test.<br><br>10. Analysis of variance.</td></tr>
<tr><td>Prerequisites and co-requisites</td><td>-</td></tr>
<tr><td>Assessment methods and criteria</td><td>
<table>
<tr><th>Subject passing criteria</th><th>Passing threshold</th><th>Percentage of the final grade</th></tr>
<tr><td>passing the colloquium with a positive grade</td><td>51.0%</td><td>30.0%</td></tr>
<tr><td>II written work accepted (with a passing grade)</td><td>51.0%</td><td>70.0%</td></tr>
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</td></tr>
<tr><td>Recommended reading</td><td>
<table>
<tr><td>Basic literature</td><td>Balicki A., Makać W., 2002, Metody wnioskowania statystycznego, UG, Gdańsk.<br><br>Biecek P., 2017, Przewodnik po pakiecie R, Oficyna wydawnicza GIS, Warszawa.<br><br>Gronicki M., Szreder M., 1992, Elementy rachunku prawdopodobieństwa i statystyki matematycznej, UG, Gdańsk.<br><br>Hellwig Z., 1993, Elementy rachunku prawdopodobieństwa i statystyki matematycznej, PWN, Warszawa.<br><br>Krzysko M., 1997, Statystyka matematyczna, UAM, Poznań.</td></tr>
<tr><td>Supplementary literature</td><td>Jóźwiak J., Podgórski J., 2000, Statystyka od podstaw, PWE, Warszawa.<br><br>Makać W., Urbanek-Krzysztofiak D., 2004, Metody opisu statystycznego, UG, Gdańsk.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
</table>
</td></tr>
<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Selection of appropriate tests.<br>2. Multivariate analysis.<br>3. What are and how to interpret Principal Components.</td></tr>
<tr><td>Work placement</td><td>Not applicable</td></tr>
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