University of Gdańsk

Subject card

Subject name and code	Statistical inference (Laboratury classes), PG_00201211		
Field of study	Physical geography and geoinformation		
Date of commencement of studies	October 2027	Academic year of realisation of subject	2027/2028
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, either independently or as part of a group, to formulate and test hypotheses regarding the causes and progression of physical-geographical processes and phenomena; selects and applies advanced research methods and tools, including statistical and geoinformatics methods, adapting them to the context where necessary; skilfully visualises the results of spatial data analysis, critically interprets the findings, and formulates conclusions and their own position based on these, which they justify 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_K03] is prepared to fulfil professional responsibilities in both independent and team-based work by advancing the field of geography, upholding the profession’s ethos, adhering to and developing the principles of professional ethics, and ensuring compliance with these principles	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 [SK8] observation of student's independent or team 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
	[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_K01] is able to behave appropriately in the workplace and in everyday life by critically evaluating information received in the light of their existing knowledge, recognising the importance of knowledge in solving cognitive and practical problems, and, when faced with difficulties, drawing on expert knowledge	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

<table>
<tr><td>Subject contents</td><td>1. The concept and types of random variable.

2. Basic types of distributions of random variables (continuous and discrete).

3. The concept of random sampling in mathematical statistics. Techniques of random sampling.

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.

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.

6. Parametric tests: how to formulate hypotheses and define the critical area; tests for mean, proportion, two means, two variances, two proportions.

7. Non-parametric tests: the essence of non-parametric tests; tests of randomness; tests of concordance; tests of homogeneity.

8. Tests in correlation and regression analysis: test for correlation coefficient and linear regression; linearity test of regression function; chi-square independence test.

9. Tests in time series analysis: test for directional coefficient of a straight line; linearity of trend test.

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>II written work accepted (with a passing grade)</td><td>51.0%</td><td>70.0%</td></tr>
<tr><td>passing the colloquium with a positive grade</td><td>51.0%</td><td>30.0%</td></tr>
</table>
</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.

Biecek P., 2017, Przewodnik po pakiecie R, Oficyna wydawnicza GIS, Warszawa.

Gronicki M., Szreder M., 1992, Elementy rachunku prawdopodobieństwa i statystyki matematycznej, UG, Gdańsk.

Hellwig Z., 1993, Elementy rachunku prawdopodobieństwa i statystyki matematycznej, PWN, Warszawa.

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.

Makać W., Urbanek-Krzysztofiak D., 2004, Metody opisu statystycznego, UG, Gdańsk.</td></tr>
<tr><td>eResources addresses</td><td></td></tr>
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<tr><td>Example issues/ example questions/ tasks being completed</td><td>1. Selection of appropriate tests.
2. Multivariate analysis.
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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