



## Subject card

Subject name and code	, PG_00059938						
Field of study	Environmental Engineering						
Date of commencement of studies	February 2024			Academic year of realisation of subject		2023/2024	
Education level	second-cycle studies			Subject group		Obligatory subject group in the field of study 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	1			Language of instruction		Polish	
Semester of study	1			ECTS credits		3.0	
Learning profile	general academic profile			Assessment form		assessment	
Conducting unit	Department of Geotechnical and Hydraulic Engineering -> Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor			dr inż. Wioletta Gorczewska-Langner			
	Teachers			dr inż. Wioletta Gorczewska-Langner			
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	15.0	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	5.0	30.0	80		
Subject objectives	The aim of the course is to familiarize students with the basics of statistics and its application aspects. As part of the lecture on the subject, the theory of issues is presented, as part of the exercises, practical aspects of using statistics in engineering, scientific and business work, while as part of the laboratory, practical skills of data analysis are practiced within the issues learned during the exercises and the lecture. As part of the course, the participant acquires, among other things, the ability to analyze data using tools such as Tableau®.						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[K7_U05] can rely on scientific sources for modern methods and technologies, and propose trends in the development of methods and rules for acquiring, filtering, processing and analyzing data	As part of the course, the course participant gets acquainted with the sources of knowledge and tools enabling further development in the direction statistics/data science.			[SU5] Assessment of ability to present the results of task [SU1] Assessment of task fulfilment		
	K7_W01	The course participant learns application approach probability calculus and statistics. Can use inference probabilistic to constraint engineering costs and business.			[SW3] Assessment of knowledge contained in written work and projects		
	K7_U09	The student is able to direct the need for further training and acquire the necessary educational materials for this purpose.			[SU4] Assessment of ability to use methods and tools		
[K7_W12] has knowledge of contemporary and useful principles on data acquisition, filtration, processing and analysis	The student learns the principles of working with data in the data science approach. In addition, he learns to use the appropriate dedicated ones tools (Tableau®, Jupyter Notebook).			[SW3] Assessment of knowledge contained in written work and projects			

Subject contents	<p><b>Lecture and exercises:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to statistics (what is statistics, how to use statistics to make decisions decisions in industrial processes, medical research and environmental research, presentation computational tools to perform statistical calculations and their capabilities)</li> <li>2. Probability (definitions, computational approaches), combinatorial calculation of probabilities</li> <li>3. Conditional probability, complete probability, Bayes' theorem.</li> <li>4. Random variable (discrete, continuous), examples of random variables (e.g. normal distribution)</li> <li>5. Sample selection methods and experiment planning</li> <li>6. Descriptive statistics and graphical data mining (preliminary data analysis)</li> <li>7. Theory of estimation (methods of obtaining least squares estimators, methods of moments etc.), calculating the values of estimators (point and interval estimation)</li> <li>8. Statistical inference, confidence intervals</li> <li>9. Testing statistical hypotheses: parametric hypotheses (tests for the mean, for the deviation standard), non-parametric hypotheses I (Chi2 tests, Kolmogorov-Smirnov test, etc.)</li> <li>10. Pseudo-random number generation, statistical permutation tests, bootstrap estimation</li> <li>11. Correlation analysis</li> <li>12. Regression analysis</li> <li>13. Regression and correlation - advanced methods</li> <li>14. Methods of data analysis</li> <li>15. Colloquium</li> </ol> <p><b>Lab:</b></p> <ol style="list-style-type: none"> <li>1. Introduction to the Jupyter Notebook environment</li> <li>2. Working with LibreOffice Calc or MS Excel</li> <li>3. Working with Tableau</li> </ol>									
Prerequisites and co-requisites	<p>Fundamentals of higher mathematics: algebra and mathematical analysis.</p> <p>Computer skills.</p> <p>Basic knowledge of MS Excel or LibreOffice Calc.</p>									
Assessment methods and criteria	<table border="1"> <thead> <tr> <th data-bbox="453 2020 794 2047">Subject passing criteria</th> <th data-bbox="799 2020 1141 2047">Passing threshold</th> <th data-bbox="1145 2020 1485 2047">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="453 2054 794 2080"></td> <td data-bbox="799 2054 1141 2080">60.0%</td> <td data-bbox="1145 2054 1485 2080">70.0%</td> </tr> <tr> <td data-bbox="453 2087 794 2114"></td> <td data-bbox="799 2087 1141 2114">80.0%</td> <td data-bbox="1145 2087 1485 2114">30.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade		60.0%	70.0%		80.0%	30.0%
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Recommended reading	Basic literature	<ul style="list-style-type: none"> <li>• Jacek Koronacki, Jan Mielniczuk, "Statystyka dla studentów kierunków technicznych i przyrodniczych."</li> <li>• Andrzej Bielicki, Wiesław Makać, "Metody wnioskowania statystycznego."</li> <li>• Wiesław Makać, Danuta Urbanek-Krzysztofiak, "Metody opisu statystycznego."</li> <li>• Jay L. Devore, "Probability and Statistics for Engineering and the Sciences. 8th edition."</li> <li>• Norman Lloyd Johnson, "Statistics and experimental design in engineering and the physical sciences."</li> </ul>
	Supplementary literature	<ul style="list-style-type: none"> <li>• Zdzisław Kaczmarek, "Metody statystyczne w hydrologii i meteorologii."</li> <li>• Stanisław Węglarczyk, "Statystyka w inżynierii środowiska."</li> <li>• Ven Te Chow, David R. Maidment, Larry W. Mays, "Applied hydrology"</li> <li>• John C. Davis "Statistics and Data Analysis in Geology. Third Edition."</li> </ul>
	eResources addresses	<p>Adresy na platformie eNauczenie:</p> <p>Statystyka i analiza danych, stac. sem. I MSU 2023/24 - Moodle ID: 11017</p> <p><a href="https://enauczenie.pg.edu.pl/moodle/course/view.php?id=11017">https://enauczenie.pg.edu.pl/moodle/course/view.php?id=11017</a></p>
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	