GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	, PG_00061711					
Field of study	Environmental Engineering					
Date of commencement of studies	October 2023		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	Part-time studies		Mode of delivery		at the university	
Year of study	1		Language of instruction		Polish	
Semester of study	1		ECTS credits		5.0	
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				
		dr inż. Wojciech Artichowicz				

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	15.0	10.0	0.0	0.0	40
	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	40	3.0	88.0	131

Subject objectives	The aim of the course is to familiarize students with the basics of statistics and its practical applications. The lecture part of the course covers the theory of the subject, while in practical exercises, students learn how to apply statistics in engineering, scientific, and business work. Additionally, in the laboratory sessions, practical data analysis skills are practiced based on the topics introduced during the exercises and lectures. Throughout the course, participants acquire skills that include working with data, processing it, and analyzing it using tools such as Tableau®.

Learning outcomes	Course outcome	Subject outcome	Method of verification
	K7_W01	The course participant learns an applied approach to probability theory and statistics. They can utilize probabilistic reasoning to reduce the costs of engineering and business activities.	[SW3] Assessment of knowledge contained in written work and projects
	[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 a data science approach. Additionally, they learn to use relevant dedicated tools, such as Tableau® and Jupyter Notebook.	[SW3] Assessment of knowledge contained in written work and projects
	[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, participants familiarize themselves with sources of knowledge and tools that enable further development in the field of statistics and data science.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task
	K7_U09	The student is capable of directing their need for further self-improvement and acquiring the necessary educational materials for this purpose.	[SU4] Assessment of ability to use methods and tools

Subject contents	Lectures and Exercises: 1. Introduction to Statistics (what is statistics, how to use statistics for decision-making in industrial processes, medical research, and environmental studies, presentation of computational tools for performing statistical calculations and their capabilities) 2. Probability (definitions, calculation approaches), combinatorial probability calculations 3. Conditional probability, independence, Bayes' theorem. 4. Random Variables (discrete, continuous), examples of random variables (e.g., normal distribution) 5. Sampling Methods and Experimental Design 6. Descriptive Statistics and Graphical Data Exploration (initial data analysis) 7. Estimation Theory (estimator properties, methods for obtaining estimators, e.g., least squares, method of moments, etc.), calculation of estimator values (point and interval estimation) 8. Statistical Inference, Confidence Intervals 9. Statistical Hypothesis Testing: Parametric Hypotheses (tests for the mean, standard deviation), Non-parametric Hypotheses I (Chi-squared tests, Kolmogorov-Smirnov test, etc.) 10. Generating Pseudorandom Numbers, Statistical Permutation Tests, Bootstrap Estimation 11. Correlation Analysis 12. Regression Analysis 13. Advanced Regression and Correlation Methods 14. Data Analysis Methods 15. Midterm Examination Laboratory: 1. Introduction to the Jupyter Notebook Environment 2. Working with LibreOffice Calc or MS Excel 3. Working with Tableau Software
Prerequisites and co-requisites	Prerequisites for this course include a basic understanding of higher mathematics, including algebra and mathematical analysis. Additionally, students should have computer literacy, including the ability to use software such as MS Excel or LibreOffice Calc at a fundamental level.

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Project	80.0%	30.0%
Examination	60.0%	70.0%

Recommended reading

Basic literature	• Jacek Koronacki, Jan Mielniczuk, "Statystyka dla studentów kierunków technicznych i przyrodniczych." • Andrzej Bielicki, Wiesław Makać, "Metody wnioskowania statystycznego." • Wiesław Makać, Danuta Urbanek-Krzysztofiak, "Metody opisu statystycznego." • Jay L. Devore, "Probability and Statistics for Engineering and theSciences. 8th edition." • Norman Lloyd Johnson, "Statistics and experimental design in engineering and the physical sciences."
Supplementary literature	• Zdzisław Kaczmarek, "Metody statystyczne w hydrologii imeteorologii." • Stanisław Węglarczyk, "Statystyka w inżynierii środowiska." • Ven Te Chow, David R. Maidment, Larry W. Mays, "Applied hydrology" • John C. Davis "Statistics and Data Analysis in Geology. Third Edition."
eResources addresses	Adresy na platformie eNauczanie: Statystyka, I sem. MSU niestac., 2023/24 - Moodle ID: 34334 https://enauczanie.pg.edu.pl/moodle/course/view.php?id=34334

Example issues/ example questions/ tasks being completed	
Work placement	Not applicable