GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	STATISTICS, PG_00038240					
Field of study	Environmental Engineering					
Date of commencement of studies	October 2024		Academic year of realisation of subject		2024/2025	
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		English	
Semester of study	1		ECTS credits		3.0	
Learning profile	general academic profile		Assessment form		assessment	
Conducting unit	Department of Hydraulic Engineering -> Faculty of Civil and Environmental Engineering					
Name and surname of lecturer (lecturers)	Subject supervisor		dr inż. Wojciech Artichowicz			
	Teachers					

Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	15.0	30.0	0.0	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	25.0	75

Subject objectives	The aim of the subject is to teach students the basics of statistics, and its practical utilization. During lectures the teorethical background of statistical methods is presented, whereas dirong tutorials practical exercises are performed. The focus of the practice is engineering, business and scientific activity. At the course attendees gain: • Basics of statistics and probability theory • Basic skills of working with data • Basic skills of data science tools: Tableau®, Python, Jupyter Notebook • Awareness of existence of data science community, f.e.: Analytics Vidhya or Kaggle

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K7_U11] can formulate reports preparing for the research work; can identify the direction of further education and complete the process of self-education"	Student performs dataset analysis using Python language in Jupyter Notebook environment and Tableau®.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task
	[K7_W12] has knowledge of contemporary and useful principles on data acquisition, filtration, processing and analysis	Student is acknowledged with rules and processes of data handling pipelines in data science. Also learns to use tools appropriate for advanced data analyses (Tableau®, Python, Jupyter Notebook)..	[SW2] Assessment of knowledge contained in presentation [SW3] Assessment of knowledge contained in written work and projects
	[K7_W01] has broadened and deepened knowledge of selected mathematics sections, including statistics components and optimization methods, and mathematical and numerical methods necessary for: 1) modeling and analysis of water supply systems and their physical phenomena; 2) description and analysis of flood protection systems; 3) functional analysis, optimization and reliability of sanitary engineering systems; 4) description of phenomena related to the flow of water in the environment, in pipes and open channels, filtration, migration of pollutants	Attendee learns how to apply probability theory and statistics in real life scenarios. Is capable of reducing cost and risk of business and engneering projects based on probabilistic reasoning.	[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	An attendee is acknowledged with sources of tools and knowledge bases allowing for further development in the field of datta science and statistics.	[SU1] Assessment of task fulfilment [SU5] Assessment of ability to present the results of task

Subject contents	**Lectures and tutorials**
	1.Introduction (what is statistics, how do engineers, medicians, biologists use it, tools used for statistical computing)
	2. Probability (definitions, interpretations and approaches of computing), combinatorical computation of probability
	3. Conditional probability, totla probability, Bayes theorem
	4. Random variable (discrete and continuous), examples of random variables (f.e. normal distribution)
	5. Sample collection methods and design of experiments
	6. Descriptive statistics and graphical data exploration
	7. Estimation theory (maximum likelihood method, least squares method, etc.), point and interval estimation
	8. Statistical inference, confidence intervals
	9. Statistical hypotheses testing, parametric hypostheses, nonparametric hypotheses
	10. Pseudo random number generators, permutation tests, bootstrap estimation
	11 Regression and correlation
	12. ANOVA
	13 Regression and correlation - advanced approach
	14. Data analysis
	15. End test
	Workshops: 1. Data anlysis with Tableau 2. Introduction to Jupyter Notebook
Prerequisites and co-requisites	Basics of advanced mathematics: algebra and calculus Basic computer skills.

Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	End test	60.0%	70.0%
	Project (datase analysis)	80.0%	30.0%

Recommended reading	Basic literature	Jay L. Devore, „Probability and Statistics for Engineering and the Sciences. 8th edition."
		Norman Lloyd Johnson, „Statistics and experimental design in engineering and the physical sciences."

	Supplementary literature	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:
Example issues/ example questions/ tasks being completed	Materials (including exercises and project subjects) can be found in [Github repository]().	
Work placement	Not applicable	