



Subject card

Subject name and code	Statistics and data analysis, PG_00061705						
Field of study	Recycling and Energy Recovery						
Date of commencement of studies	October 2023	Academic year of realisation of subject			2024/2025		
Education level	first-cycle 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	2	Language of instruction			English		
Semester of study	3	ECTS credits			6.0		
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. Wojciech Artichowicz					
	Teachers	dr inż. Wojciech Artichowicz dr inż. Wioletta Gorczewska-Langner					
Lesson types and methods of instruction	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	20.0	20.0	20.0	0.0	0.0	60
	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	60	10.0		80.0		150
Subject objectives	<p>The aim of the subject is to teach students the basics of statistics, and its practical utilization. During lectures the teoretical 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:</p> <ul style="list-style-type: none">• Basics of statistics and probability theory• Basic skills of working with data• Basic skills of data science tools: Libre Office Calc, Tableau®, Python, Jupyter Notebook• Awareness of existence of data science community, f.e.: Kaggle						

Learning outcomes	Course outcome	Subject outcome	Method of verification
	[K6_W02] analyzes engineering and technological issues and problems in the area of raw materials and energy recovery using appropriate and appropriate analytical, numerical and experimental tools and methods	Is able to determine the possibility of using data analysis and statistics tools to solve problems in the field of raw materials and energy recovery.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_W01] demonstrates knowledge and understanding of mathematics and other exact sciences and engineering disciplines at the level necessary to solve theoretical, engineering and technological problems and issues.	Is able to apply knowledge of statistics to analyze data and compare two or more groups.	[SW3] Assessment of knowledge contained in written work and projects
	[K6_U06] uses information technology to improve data analysis and design support.	Knows and is able to choose tools appropriate to conduct statistical analysis of data.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment
	[K6_U01] applies knowledge of mathematics and other exact sciences and engineering disciplines to solve theoretical, engineering and technological problems and issues.	Is able to apply knowledge of statistics to analyze data and compare two or more groups.	[SU4] Assessment of ability to use methods and tools [SU3] Assessment of ability to use knowledge gained from the subject [SU2] Assessment of ability to analyse information [SU1] Assessment of task fulfilment

Subject contents	<p>Lectures and tutorials</p> <ol style="list-style-type: none"> 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. Machine learning 16. End test <p>Workshops:</p> <ol style="list-style-type: none"> 1. Data anlysis with Tableau 2. Introduction to Jupyter Notebook for statistical computing 									
Prerequisites and co-requisites	<p>Basics of advanced mathematics: algebra and calculus</p> <p>Basic computer skills.</p>									
Assessment methods and criteria	<table border="1"> <thead> <tr> <th>Subject passing criteria</th> <th>Passing threshold</th> <th>Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td>Project (datase analysis)</td> <td>80.0%</td> <td>30.0%</td> </tr> <tr> <td>End test</td> <td>60.0%</td> <td>70.0%</td> </tr> </tbody> </table>	Subject passing criteria	Passing threshold	Percentage of the final grade	Project (datase analysis)	80.0%	30.0%	End test	60.0%	70.0%
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Recommended reading	Basic literature	<p>Jay L. Devore, Probability and Statistics for Engineering and the Sciences. 8th edition.</p> <p>Norman Lloyd Johnson, Statistics and experimental design in engineering and the physical sciences.</p> <p>"An Introduction to statistical Learning Theory With Applications in Python" G. James, D. Witten, T. Hastie, R. Tibrishani, J. Taylor. Link to pdf</p>
	Supplementary literature	<p>SciPy Stats documentation.</p> <p>scikit-learn library documentation.</p>
	eResources addresses	<p>Uzupełniające Adresy na platformie eNauczanie:</p>
Example issues/ example questions/ tasks being completed		
Work placement	Not applicable	

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