



## Subject card

Subject name and code	STATISTICS, PG_00059998						
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	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	Faculty of Civil and Environmental Engineering						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Wojciech Artichowicz					
	Teachers	dr inż. Wojciech Artichowicz					
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	30.0	80		
Subject objectives	<p>The aim of the subject is to teach students the basics of statistics, and its practical utilization. During lectures the theoretical background of statistical methods is presented, whereas during 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"><li>• Basics of statistics and probability theory</li><li>• Basic skills of working with data</li><li>• Basic skills of data science tools: Tableau®, Python, Jupyter Notebook</li><li>• Awareness of existence of data science community, f.e.: Analytics Vidhya or Kaggle</li></ul>						
Learning outcomes	Course outcome	Subject outcome			Method of verification		
	[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_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 data science and statistics.			[SU1] Assessment of task fulfillment [SU5] Assessment of ability to present the results of task		
	K7_W01	The student knows the basic concepts and methods of mathematical and descriptive statistics.			[SW1] Assessment of factual knowledge		
	K7_U09	An attendee is acknowledged with sources of tools and knowledge bases allowing for further development in the field of data science and statistics.			[SU4] Assessment of ability to use methods and tools [SU2] Assessment of ability to analyse information		

Subject contents	<p><b>Lectures and tutorials</b></p> <ol style="list-style-type: none"> <li>1. Introduction (what is statistics, how do engineers, medicians, biologists use it, tools used for statistical computing)</li> <li>2. Probability (definitions, interpretations and approaches of computing), combinatorical computation of probability</li> <li>3. Conditional probability, totla probability, Bayes theorem</li> <li>4. Random variable (discrete and continuous), examples of random variables (f.e. normal distribution)</li> <li>5. Sample collection methods and design of experiments</li> <li>6. Descriptive statistics and graphical data exploration</li> <li>7. Estimation theory (maximum likelihood method, least squares method, etc.), point and interval estimation</li> <li>8. Statistical inference, confidence intervals</li> <li>9. Statistical hypotheses testing, parametric hypostheses, nonparametric hypotheses</li> <li>10. Pseudo random number generators, permutation tests, bootstrap estimation</li> <li>11 Regression and correlation</li> <li>12. ANOVA</li> <li>13 Regression and correlation - advanced approach</li> <li>14. Data analysis</li> <li>15. End test</li> </ol> <p><b>Workshops:</b></p> <ol style="list-style-type: none"> <li>1. Data anlysis with Tableau</li> <li>2. Introduction to Jupyter Notebook for statistical computing</li> </ol>											
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 data-bbox="456 1697 794 1727">Subject passing criteria</th> <th data-bbox="799 1697 1137 1727">Passing threshold</th> <th data-bbox="1142 1697 1469 1727">Percentage of the final grade</th> </tr> </thead> <tbody> <tr> <td data-bbox="456 1733 794 1762">Project (datase analysis)</td> <td data-bbox="799 1733 1137 1762">80.0%</td> <td data-bbox="1142 1733 1469 1762">30.0%</td> </tr> <tr> <td data-bbox="456 1769 794 1798">End test</td> <td data-bbox="799 1769 1137 1798">60.0%</td> <td data-bbox="1142 1769 1469 1798">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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End test	60.0%	70.0%										
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>										

	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		
Work placement	Not applicable	