



Subject card

Subject name and code	Inference in Multivariate Statistics, PG_00044136						
Field of study	Mathematics						
Date of commencement of studies	October 2026	Academic year of realisation of subject			2026/2027		
Education level	second-cycle studies	Subject group			Specialty subject group 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	2	ECTS credits			5.0		
Learning profile	general academic profile	Assessment form			exam		
Conducting unit	Division of Differential Equations and Applications of Mathematics -> Institute of Applied Mathematics -> Faculty of Applied Physics and Mathematics -> Faculties of Gdańsk University of Technology						
Name and surname of lecturer (lecturers)	Subject supervisor	dr inż. Anna Szafrńska					
	Teachers	dr inż. Anna Szafrńska					
Lesson types	Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
	Number of study hours	30.0	0.0	15.0	0.0	15.0	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	5.0	60.0	125		
Subject objectives	Classical statistical introduction to data science. Computer laboratory oriented on practicable R packages tools and/or Python language.						
Learning outcomes	Course outcome	Subject outcome		Method of verification			
	[K7_W07] describes well symbolic computation software package and statistical data processing package.	Is able to analyze empirical data using R packages.		[SW1] Assessment of factual knowledge			
	[K7_K04] forms opinions on mathematical issues	Is able to draw conclusions from the results obtained using data analysis methods.		[SK5] Assessment of ability to solve problems that arise in practice			
[K7_U06] uses probability distributions and their properties in practical issues, is familiar with the basics of statistics and the basics of statistical data processing	Uses techniques of mathematical statistics to analyze selected data sets with the help of a computer.		[SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU1] Assessment of task fulfilment				
Subject contents	Course content – lecture Elements of linear algebra and functional analysis for multivariate statistical methods. Multivariate normal distribution, descriptive statistics and their distributions, principal component analysis, factor analysis, and cluster analysis.						
	Course content – laboratory Implementation of topics: 1. Statistical distance. 2. Spectral distribution of the covariance matrix. 3. Multivariate normal distribution. 4. Distributions of descriptive statistics. 5. Decomposition of the covariance matrix. 6. Principal component analysis. 7. Cluster analysis - k-means method.						
	Course content – seminar Preparing a presentation on a selected topic, e.g.: variable selection methods, multivariate linear regression, cluster analysis (hierarchical clustering, fuzzy clustering, density algorithms), discriminant analysis (linear and quadratic), decision trees, neural networks (unidirectional, recurrent, convolutional).						

Prerequisites and co-requisites	Courses completed: Probability Theory, Mathematical Statistics.		
Assessment methods and criteria	Subject passing criteria	Passing threshold	Percentage of the final grade
	Seminar	0.0%	10.0%
	Laboratory	50.0%	45.0%
	Exam	50.0%	45.0%
Recommended reading	Basic literature	<p>J.Kogan, Introduction to Clustering Large and High-Dimensional Data, Cambridge University Press, 2007.</p> <p>T.Panek, J.Zwierzchowski, Statystyczne metody wielowymiarowej analizy porównawczej, Oficyna Wydawnicza SGH, 2013.</p> <p>I.Koch, Analysis of Multivariate and High Dimensional Data, Cambridge University Press, 2014.</p> <p>R.Johnson, D.Wichern, Applied Multivariate Statistical Analysis, Pearson, 2014.</p>	
	Supplementary literature	<p>W.K.Hardle, L.Simar, Applied Multivariate Statistical Analysis, Springer, 2015.</p> <p>C.Chatfield, A.J.Collins, Introduction to Multivariate Analysis, CRC, 2017.</p>	
	eResources addresses		
Example issues/ example questions/ tasks being completed	Determine the principal components of the given covariance matrix. Using the k-means method, cluster the given data set.		
Practical activities within the subject	Not applicable		

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