GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

Subject name and code	MULTIVARIATE DATA ANALYSIS, PG_00070562		
Field of study	Economic Analytics		
Date of commencement of studies	October 2026	Academic year of realisation of subject	2027/2028
Education level	second-cycle studies	Subject group	Specialty subject group 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	2	Language of instruction	Polish
Semester of study	3	ECTS credits	3.0
Learning profile	general academic profile	Assessment form	exam
Conducting unit	Department of Statistics and Econometrics -> Faculty of Management and Economics -> Faculties of Gdańsk University of Technology		
Name and surname of lecturer (lecturers)	Subject supervisor	dr hab. Marta Kuc-Czarnecka	
	Teachers		

Lesson types

Lesson type	Lecture	Tutorial	Laboratory	Project	Seminar	SUM
Number of study hours	9.0	0.0	18.0	0.0	0.0	27

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	27	3.0	45.0	75

Subject objectives

preparation of students to apply advanced methods of multi-dimensional analysis in solving complex socio-economic and business problems.

Learning outcomes

Course outcome	Subject outcome	Method of verification
[K7_W06] knows and understands the principles of evaluating the reliability of utilized data, applying in-depth specialized knowledge in the field of economic analysis.	knows and understands approaches to assessing data quality and reliability in multivariate analysis and their importance for interpreting complex economic phenomena.	[SW3] Assessment of knowledge contained in written work and projects
[K7_K03] responsibly fulfills professional roles, demonstrating the ability to identify ethical dilemmas and recognize and evaluate alternative courses of action.	is able to select and apply multivariate analysis methods to complex problems, integrating data from multiple sources and placing them in a coherent analytical context.	[SK4] Assessment of communication skills, including language correctness [SK5] Assessment of ability to solve problems that arise in practice
[K7_U01] creates innovative solutions for complex and unstructured processes, considering unpredictable environmental conditions through the synthesis of information from various sources.	is ready to use data analysis methods responsibly, recognising their limitations and the ethical considerations associated with their application.	[SU1] Assessment of task fulfilment [SU2] Assessment of ability to analyse information [SU3] Assessment of ability to use knowledge gained from the subject [SU4] Assessment of ability to use methods and tools [SU5] Assessment of ability to present the results of task

Subject contents

Course content – lecture

1. Fundamentals of Multivariate Statistical Analysis (MSA)
2. Databases. Eurostat, OECD, World Bank and ILO as the main source of data for multivariate analysis
3. Possibilities of using MSA for socio-economic and business analysis
4. Selection of diagnostic variables, similarity measures
5. Selection of diagnostic variables, similarity measures
6. Transformation of diagnostic variables
7. Cluster analysis (hierarchical methods, k-means method, density-based clustering (DBSCAN))
8. Principal Component Analysis (PCA)
9. Sparse Principal Component Analysis
10. Factor Analysis
11. Correspondence Analysis
12. Discriminant Analysis
13. Multidimensional Scaling

Course content – laboratory

1. Fundamentals of Multivariate Statistical Analysis (MSA)
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3. Possibilities of using MSA for socio-economic and business analysis
4. Selection of diagnostic variables, similarity measures
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6. Transformation of diagnostic variables
7. Cluster analysis (hierarchical methods, k-means method, density-based clustering (DBSCAN))
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9. Sparse Principal Component Analysis
10. Factor Analysis
11. Correspondence Analysis
12. Discriminant Analysis
13. Multidimensional Scaling

Prerequisites and co-requisites

Knowledge of descriptive and mathematical statistics

Assessment methods and criteria

Subject passing criteria	Passing threshold	Percentage of the final grade
Group project	60.0%	50.0%
Oral exam	60.0%	50.0%

Recommended reading

Basic literature	1. Walesiak M. Gatnar E. (2009). Statystyczna analiza danych z wykorzystaniem programu R 2. Panek T. Zwierzchowski J. (2013). Statystyczne metody wielowymiarowej analizy porównawczej. Teoria i zastosowania 3. Daniel J. Denis (2021). Applied Univariate, Bivariate, and Multivariate Statistics : Understanding Statistics for Social and Natural Scientists, with Applications in SPSS and R 4. Rencher A. Christensen W. (2011). An Introduction to Applied Multivariate Analysis with R
Supplementary literature	1. Balicki A. (2013) Statystyczna analiza wielowymiarowa i jej zastosowania społeczno-ekonomiczne 2. Rencher A. Christensen W. (2012). Methods of Multivariate Analysis
eResources addresses	

Example issues/ example questions/ tasks being completed

1. Explain what the transformation of diagnostic variables entails in multivariate statistical analysis.
2. What is the interpretation of the Euclidean distance in cluster analysis, and when should it not be used?
3. In principal component analysis (PCA), how should the variance explained by each component be interpreted?

Practical activites within the subject

Not applicable

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