UNIVERSIDADE LUSÍADA
LISBOA

Course Unit Program
Multivariate Statistics

Academic Year 2025/2026

1. Organic Unit

Faculty of Business and Economic Sciences

2. Course

Human Resource Management

3. Cycle

1st

4. Course Unit

Multivariate Statistics (11314)

5. Scientific Area

6. Curricular Year

2nd

7. Type of Curricular Unit / Semester

2nd Semester

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8. Class type and workload (work time)

Theoretical classes:	
Practical classes:	
Theoretical-Practical Classes	30,00
Tutorial Guidance:	20,00

9. ECTS Credits

6,00

10. Scientific Area Coordinator

11. Regent

Prof. Doutor JOÃO JOSÉ AMARO AMADOR LEITÃO

12. Assistants

13. Teaching Language

Portuguese

14. General Objectives

Develop the elements introduced in basic Statistics and Probability courses in a multivariate framework, providing the instruments that allow analyzing multidimensional data. The course will focus on a good understanding of the methods and on training in the application conditions, including knowledge of methods for collecting information, constructing a survey and defining the appropriate experimental design for each situation.

15. Specific Objectives

Show the potential of matrix notation for the treatment of multidimensional data. Explore the graphical techniques of exploratory analysis of multidimensional data. Approach to dimension reduction techniques for continuous variables (principal component analysis) and for qualitative variables (factorial analysis of correspondences). Presentation of basic automatic classification techniques. Linear, log-linear and discriminant analysis models.

16. Skills to be acquired

Successful completion of this course will provide students with skills in multivariate statistics, allowing them to understand some of these statistical analyses in multivariate distributions as well as their execution.

17. Teaching Methodology

In the theoretical-practical classes (the teacher introduces the concepts and deduces the abstract aspects); tutorial classes (the teacher presents the applications to the students and with their active participation a solution is sought.

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18. Course Unit Program

1. MULTIVARIATE ANALYSIS MODELS.

In this part of the course, models that allow establishing relationships between variables are studied.

1.1. Linear models: regression and analysis of variance.
1.2. Log-linear models.

2. DESCRIPTIVE METHODS AND NOTATIONS.

It is intended to show how matrix theory allows an easy treatment of multidimensional data and to indicate the graphical techniques used in multidimensional exploratory analysis.
Review of the basic notions of Linear Algebra.
Data frame. Weight matrix. Gravity center. Variance-covariance matrix and correlation matrix. The space of individuals. The role of metrics. The inertia.
Multidimensional graphic techniques.

3. MULTIVARIATE DATA ANALYSIS TECHNIQUES.

Dimension reduction and automatic classification techniques are studied.

3.1. CANONICAL CORRELATION.
3.2. ANALYSIS ON MAIN COMPONENTS.
Projection of individuals into subspaces: principal axes, principal components and principal factors. Reconstitution formulas. Interpretation and quality of the results of a principal component analysis.
3.3. DISCRIMINANT ANALYSIS. Discriminant factor analysis. The case of two groups. Assignment rules.
3.4. AUTOMATIC SORTING. Distances and similarities. Partition methods and hierarchical methods
3.5. FACTOR ANALYSIS OF SIMPLE CORRESPONDENCES
Contingency tables and associated point clouds. The chi-square metric.
Interpretation and quality of the results of a factorial analysis of simple correspondences.
3.6. FACTOR ANALYSIS OF MULTIPLE CORRESPONDENCES.
Data and notations. Burt's painting. Interpretation and quality of the results of a factorial analysis of multiple correspondences.

19. Assessment Methods

According to the school's internal regulations, the assessment will have a continuous and a frequency component. The continuous component will comply with the rules established by the appropriate regulations.

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20. Didactic Resources

Classes will be taught using visual presentations and computer systems will be made available for carrying out practical exercises.

21. Sustainability Objectives

The course contributes to the following Sustainable Development Goals within the UN framework and definition:
4 - Quality education - Through the acquisition of technical skills in multivariate statistics.
5 - Gender equality - Promoting inclusive and gender-sensitive teaching practices.

22. Keywords

Multiple regression
Analysis of variance
Principal components analysis

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23. Main Bibliography

Author(s):	R. Ho		
Title:	Handbook of Univariate and Multivariate Data Analysis with SPSS		
Edition:	1ª	Year:	2014
Local:	Boca Raton, Florida		
Publisher:	CRC Press		
ISBN Code:			

Author(s):	T. Cleff		
Title:	Applied Statistics and Multivariate Data Analysis for Business and Economics		
Edition:	1ª	Year:	2019
Local:	Cham, Switzerland		
Publisher:	Springer		
ISBN Code:			

Author(s):			
Title:			
Edition:		Year:	
Local:			
Publisher:			
ISBN Code:			

24. Complementary Bibliography

Author(s):	J. D. Jobson		
Title:	Applied Multivariate Data Analysis, vol II: Categorical and Multivariate Methods		
Edition:	2ª	Year:	1992
Local:	Paris		
Publisher:	Springer-Verlag		
ISBN Code:			

Author(s):	G. A. F. Seber		
Title:	Multivariate Observations		
Edition:	1ª	Year:	1994
Local:	New York		
Publisher:	John Wiley		

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Autor / Author	Prof. Doutor JOÃO JOSÉ AMARO AMADOR LEITÃO
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