

Basic Mathematics

1. Objectives

The objective of the Basic Mathematics course is to refresh elementary calculus and matrix algebra and to introduce the R language. This course has two parts. The first part is a refresher of functions and limits. The second part covers the essentials of matrix algebra, including diagonalization and classification of quadratic forms. There are three complementary computer sessions, based on the R language.

2. Methodology

2.1. Contents

1. Functions and limits
2. Trigonometric functions and complex numbers
3. Introduction to R
4. Vectors
5. Product of vectors
6. Matrices
7. Product of matrices
8. Eigenvalues and eigenvectors
9. Quadratic forms

2.2. Description of the methodology

The course is based on lectures, given in a traditional, professor-to-student way. The topics covered in the lectures are explained in a set of lecture notes.

2.3. Number and title of the sessions

The course has 12 sessions, listed in the table at the end of this outline.

2.4. Description of the topics

The topics covered in each session are described in the table.

2.5. Required readings

[MATH-01] Functions and limits

[MATH-02] Trigonometric functions and complex numbers

[MATH-03] Vectors

[MATH-04] Product of vectors

[MATH-05] Matrices

[MATH-06] Product of matrices

[MATH-07] Eigenvalues and eigenvectors

[MATH-08] Quadratic forms

2.6. Optional readings

R Larson (2004), Elementary Linear Algebra, Brooks/Cole.

3. Grading

The grades are based on the exercises delivered at the end of each session (60%) and the final exam (40%)

4. Competences

4.1 General Competences

- To understand matrix formulas
- To bridge the gap between textbook formulas and their implementation in the computer

4.2 Specific Competences

- To understand the concepts of linear independence and orthogonality
- To manage matrix operations: product, determinant, inverse and diagonalization
- To manage functions and limits
- To work with functions in a programming environment
- To manage matrix algebra in the computer

5. Course Outline and Bibliography

SESSION	DESCRIPTION	DOCUMENTS
15/SEP	Functions and limits	Outline of the Basic Mathematics course [MATH-01] Functions and limits
15/SEP	Computer session (1)	
19/SEP	Trigonometric functions and complex numbers	[MATH-02] Trigonometric functions and complex numbers
19/SEP	Computer session (2)	
21/SEP	Vectors	[MATH-03] Vectors
21/SEP	Product of vectors	[MATH-04] Product of vectors
23/SEP	Matrices	[MATH-05] Matrices
23/SEP	Product of matrices	[MATH-06] Product of matrices
26/SEP	Eigenvalues and eigenvectors	[MATH-07] Eigenvalues and eigenvectors
26/SEP	Quadratic forms	[MATH-08] Quadratic forms
28/SEP	Discussion of assignments	
28/SEP	Computer session (3)	
30/SEP	Final exam	
30/SEP	Final exam	

6. Professor's Biography



Prof. Miguel-Angel Canela
Visiting Professor of Managerial Decision Sciences

Miguel Angel Canela teaches quantitative methods at IESE Business School. He holds a Ph. D. degree in Mathematics from the Universitat de Barcelona and has been a professor at this university for thirty years, as well as a senior consultant and director of the Master in Quality Management at the Institut Català de Tecnologia.

After some years devoted to research in mathematical analysis, Prof. Canela's interest was driven towards interdisciplinary research. His research experience covers a wide spectrum of applications, from statistics and mathematical modelling to diverse fields such as biochemistry, botany, nutrition and management science. He is actually working on the application of data mining techniques to business problems.