# 1. OVERVIEW

| | |
|---|---|
| **Subject area** | Business Mathematics |
| **Degree** | Bachelor's Degree in Business Administration and Management |
| **School/Faculty** | SOCIAL SCIENCE AND COMMUNICATION |
| **Year** | First |
| **ECTS** | 6 ECTS |
| **Type** | Core |
| **Language(s)** | Spanish and English |
| **Delivery mode** | On campus/Online |
| **Semester** | First semester |
| **Year** | 2024/2025 |
| **Coordinating professor** | Elia María Pérez García |

# 2. INTRODUCTION

Mathematics is a core subject area within the Bachelor's Degree in Business Administration and Management, worth 6 ECTS credits.

The presence of Mathematics in economics and business is essential for describing complex economic relationships and formulating propositions on behavioural relationships. Essentially, all areas of mathematics are applicable to any branch of economics. For example, algebra is useful for data presenting and processing, input-output analysis, accountancy analysis, financial modelling, the study of statistical roles and econometric models, activity planning through mathematical programming, and business management and control.

On the other hand, functional analysis is used to find good statistical adjustment models, to study qualitative and quantitative models in economics, to distribute and allocate resources or to plan activities efficiently. Dynamic analysis is used in dynamic economics to trace movement over time, which is useful for viewing the quantitative and qualitative evolution of economic variables. It also allows for the study of economic behaviour in the short/medium/long term, being at the basis of economics.

# 3. LEARNING OUTCOMES

**KNOWLEDGE (CON, by the acronym in Spanish):**

**CON4**. Identify concepts and tools from mathematics, statistics and econometrics that enable better analysis of economic and business variables and a better understanding of business decisions and problems.

- Understand key concepts of linear algebra, differential calculus and operations research applied to solving business problems.

**ABILITIES (HAB, by the acronym in Spanish):**

**HAB2.** Solve problems and practical cases using mathematical and data analysis techniques and tools to solve economic issues. Use basic calculus, algebra and programming methods to gain a better understanding of the operational functioning of the company and its environment.

- Analyse and complete problems of linear algebra, differential calculus and operations research to demonstrate the understanding of the theoretical concepts studied.

**SKILLS (COMP, by the acronym in Spanish):**

**COMP04**. Analyse, integrate and assess the legal, sociocultural and economic information needed in different decision-making processes.

# 4. CONTENTS

The contents of the subject area, which will be covered through a range of activities, are as follows:

**BLOCK 1: Functional analysis. Differential and integral calculus**

**Topic 1. Functions of a variable.**

1.1 Elementary functions. Domain.
1.2 Limits and continuity
1.3 Derivability
1.4 Local study of functions
1.5 Function optimization
1.6 Economic applications.

The learning outcomes of this unit are: Learn about the elementary functions; calculate the domain of any function; know the concept of the limit of a function and calculate the limit of a function at a point and solve indeterminacies; know the definition of a continuous function at a point and discontinuous functions; know the definition of the derivative of a function at a point and how its applied to the study of a function.

**Topic 2. Functions of several variables**

2.1 Elementary functions. Domain and level curves.
2.2 Optimisation.
2.3 Economic applications.

Learning Outcomes: Learn about multivariable functions, their graphical representation, and calculate and classify the critical points of a function of two variables.

**Topic 3. Integral Calculus**

3.1 Concept of integral
3.2 Methods of integration
3.3 Economic applications.

Learning Outcomes: To know the concept of integral and know and understand how to apply basic methods of integration.

**BLOCK 2: Linear Algebra. Solving systems of equations and matrix analysis**

**Topic 4: Matrices and systems of linear equations**

4.1 Introduction to linear algebra.
4.2 Matrices and determinants
4.3 Systems of linear equations
4.4 Economic applications.

Learning Outcomes: To know systems of linear equations and their expression in matrix forms; to know matrix operations and how to calculate determinants; to know different methods of solving systems of linear equations using matrices and determinants.

**BLOCK 3: Linear optimization. Operative investigation**

**Topic 5: Linear optimisation. Operative investigation**

5.1 Graphical formulation and solutions of mathematical programming.
5.2 Constrained optimisation.
5.3 Lagrange multipliers.
5.4 Economic applications.

Learning Outcomes: Formulate and graphically represent mathematical programming problems; solve problems of constrained optimisation; learn about other methods of optimising multivariable functions.

## 5. TEACHING/LEARNING METHODS

The types of teaching-learning methodologies used are indicated below:

**Campus-based mode:**

- Cooperative learning.
- Problem Based Learning (PBL)
- Master classes

**Online mode:**

- Cooperative learning.
- Problem Based Learning (PBL)
- Master classes via online seminar

## 6. LEARNING ACTIVITIES

The types of learning activities, plus the amount of time spent on each activity, are as follows:

**On campus mode:**

| Learning activity | Number of hours |
|---|---|
| Lectures | 50 h |
| Independent working | 20 h |
| Case studies and problem solving | 40 h |
| Group work | 20 h |
| Knowledge tests | 10 h |
| Tutorials | 10 h |
| **TOTAL** | **150 h** |

**Online mode:**

| Learning activity | Number of hours |
|---|---|
| Online seminars | 5 h |
| Reading course material and consulting complementary resources | 22,5 h |
| Individual applied activities: problems, case studies, projects | 35 h |
| Collaborative applied activities | 12,5 h |
| Tutorials | 17,5 h |
| Self-assessment questionnaires and knowledge tests | 7,5 h |
| Autonomous learning | 50 h |
| TOTAL | 150 h |

# 7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

**On campus mode:**

| Assessment system | Weighting |
|---|---|
| Knowledge tests | 50% |
| Written reports; case analysis and collaborative projects | 20% |
| Solving problems, case analysis and individual projects | 30% |

**Online mode:**

| Assessment system | Weighting |
|---|---|
| Knowledge tests | 50% |
| Written reports, case analysis and collaborative projects | 20% |
| Solving problems, case analysis and individual projects | 30% |

When you access the course on the Campus Virtual, you'll find a description of the assessment activities you have to complete, as well as the delivery deadline and assessment procedure for each one.

## 7.1. First exam period

To pass the course in the first exam period, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

Final grade will be the weighted average of all the activities and has to be at least 5.0 over 10.0.

Attendance has to be greater than 50% of all lessons.

University regulations regarding plagiarism will be followed

## 7.2. Second exam period

To pass the course in the second exam period, you must obtain a final grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of at 5.0 in the final exam in order for it to count towards the final grade along with all the grades corresponding to the other activities.

The student must deliver the activities not successfully completed in the first exam period after having received the corresponding corrections from the professor, or those that were not delivered in the first place.

University regulations regarding plagiarism will be followed

# 8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

| Assessment activities | Deadline |
|---|---|
| Diagnostic test | Weeks 0–2 |
| Resolution of individual and/or cooperative application exercises | Weeks 1–3 |
| Resolution of individual and/or cooperative application exercises | Weeks 4–7 |
| Midterm knowledge test | Weeks 9–10 |
| Resolution of individual and/or cooperative application exercises | Weeks 10–13 |
| Collaborative work presentation | Weeks 14–18 |
| Resolution of individual and/or cooperative application exercises | Weeks 14–16 |
| Midterm knowledge test | Weeks 16–17 |
| Final knowledge test | Weeks 18–19 |

This schedule may be subject to changes for logistical reasons related to the activities. The student will be notified of any change in due time via the appropriate channels.

## 9. BIBLIOGRAPHY

The recommended reading for the subject area is listed below. All publications are available in the Dulce Chacón University Library for reference or loan.

**As an introduction and revising:**

• García Pineda y colab. Iniciación a la Matemática Universitaria. Curso 0. Thomson

**To complete:**

• Alamillos, am, et.al.: Matemáticas para la Economía, Administración y Dirección de Empresas. ED Universitas
• Balbás, a, et. al. (1998) Análisis matemático para la economía (tomos I y II), Editorial AC. Madrid.
• Larson, et. al. (1999) Cálculo. (volúmenes 1 y 2). Editorial McGraw-Hill. Madrid.
• Burgos, J. (1993) Álgebra lineal. Editorial McGraw-Hill. Madrid. • Balbás, A, et. al.(1990) Programación matemática. Editorial AC. Madrid.
• Balbás, A, et. al.(1990) Programación matemática. Editorial AC. Madrid.
• Tan. S.T.(1998) Matemática para Administración y Economía. International Thomson Editores. México.
• Borbolla, R (2000) Optimización, cuestiones, ejercicios y aplicaciones a la economía. Prentice Hall.
• Sydsaeter,K, Hammond, P. Essential Mathematics for Economic Analysis, 4th Edition. 2012.

**Other digital resources:**
• To reinforce previous neccesary knowledge students are encourage to follow the leveling course BASIC STEAM-Matemáticas and review videos of the teaching videos AulaUE.

## 10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

The Educational Guidance and Diversity Unit (ODI, by the acronym in Spanish) offers support to our students throughout their university experience to help them achieve their academic goals. Our work also centres around the inclusion of students with special educational needs, accessibility for all on the different university campuses and equal opportunities.

This Unit offers students:

1. Support and follow-up by means of personal counselling and plans for students who need to improve their academic performance.

2. With regard to support for diversity, non-significant curricular adjustments are made, i.e. in terms of methodology and assessment, for those students with special educational needs, thus pursuing equal opportunities for all students.

3. We offer students a variety of extracurricular learning resources for developing different skills to enrich their personal and professional development.

4. Career guidance through the provision of tools and counselling to students with career doubts or who believe they have made a mistake in their choice of qualification.

Students who need educational support can contact us at:

orientacioneducativa@universidadeuropea.es

## 11. SATISFACTION SURVEYS

Your opinion matters!

Universidad Europea encourages you to complete our satisfaction surveys to identify strengths and areas for improvement for staff, degree courses and the learning process.

These surveys will be available in the survey area of your virtual campus or by email.

Your opinion is essential to improve the quality of the course.

Many thanks for taking part.