

1. BASIC INFORMATION

Course	MATHEMATICS FOR BUSINESS
Degree program	BACHELOR'S DEGREE IN BUSINESS ADMINISTRATION
School	SOCIAL SCIENCES AND COMMUNICATION
Year	FIRST COURSE
ECTS	6 ECTS
Credit type	BASIC
Semester	FIRST SEMESTER
Academic year	2024/2025
Coordinating professor	Elia María Pérez García

2. PRESENTATION

Mathematics is a basic subject within the Bachelor's Degree in Business Administration, with a value of 6 ECTS credits. The presence of Mathematics in economy and business is fundamental for describing complex economic relationships and formulation of any propositions about behavioral relations. Virtually all areas of mathematics are applicable to some branch of economics. For example, Algebra is useful in the presentation and treatment of data, in input-output analysis, in accounting analysis, in financial models, in the study of statistical functions and econometric models, in planning activities through mathematical programming and in management and business control among others.. On the other hand, the analysis of functions helps us to look for good models of data adjustment, to study qualitatively and quantitatively models in economic theory, for the distribution and allocation of resources or for efficient planning of activities; and dynamic analysis, it is used in dynamic economics for tracing very useful time trajectories and to visualize quantitatively and qualitatively the evolution of economic variables and allows the study of economic behavior in the short / medium / long term, being at the base of the theory of the economicones.

3. COMPETENCIES AND LEARNING OUTCOMES

Core competencies:

- **CB1:** That students have demonstrated to possess and understand knowledge in an area of study that is based on general secondary education, and it is usually found at a level that, although it is supported by advanced textbooks, also includes some aspects that imply knowledge coming from the vanguard of their field of study
- **CB2:** That students know how to apply their knowledge to their work or vocation in a professional manner and possess the skills that are usually demonstrated through preparation and defense of arguments and resolution of problems within their area of study.
- **CB5:** That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

Cross-curricular competencies:

- **CT4:** Influential leadership. Influence others to guide and direct them towards specific objectives and goals, taking into consideration their points of view, especially in situations derived from volatile, uncertain, complex and ambiguous environments in today's world.
- **CT5:** Teamwork. Cooperate with others in shared objectives, participating actively, empathically and exercising active listening and respect for all members.
- **CT8:** Ethical-social competence. Show ethical behavior and social commitment in performance of professional activities, as well as sensitivity to inequality and diversity
- **CT13:** Problem solving: Ability to find a solution to a confusing question or a complicated situation without a predefined solution.
- **CT17:** Ability to integrate and actively collaborate with other people, areas and / or organizations to achieve common objectives.

Specific competencies:

- **CE21:** Ability to use the mathematical necessary tools to solve economic problems and using basic methods of calculus, algebra and programming.

Learning outcomes:

- **RA1.** Understand the basic concepts related to linear algebra, differential calculus and operational research applied to solving business problems.
- **RA2.** Analyze and carry out linear algebra, differential calculus, and operational research problems that demonstrate understanding of the theoretical concepts covered

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

Competencies	Learning outcomes
CB1, CT4, CE21	RA1. Understand the basic concepts related to linear algebra, differential calculus and operational research applied to solving business problems
CB2, CB5, CT5, CT8, CT13, CT17, CE21	RA2. Analyze and carry out linear algebra, differential calculus, and operational research problems that demonstrate understanding of the theoretical concepts covered.

4. CONTENT

Contents of the subject that will be:

BLOCK 1: Analysis of functions. Differential and integral calculus Topic

1. Functions of one variable.
 - 1.1 Elementary functions. Domain.
 - 1.2 Limits and continuity
 - 1.3 Derivability
 - 1.4 Local study of the functions.
 - 1.5 Optimization of functions
 - 1.6 Economic applications

Learning objectives of this unit are: knowing elementary functions; calculate the domain of any function; know the concept of limit of a function and calculate the limit of a function at a point and solve indeterminacies; Knowing definition of a continuous function at a point and a discontinuity; know the definition of derivative of a function at a point and its applications in the study of a function.

Topic 2. Functions of several variables

- 2.1 Elementary functions. Domain and Contour lines
- 2.2 Optimization
- 2.3 Economic applications.

Learning objectives: Know the functions of several variables and their graphic 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 Integration methods
- 3.3 Economic applications

Learning objectives: Knowing concept of integral and knowing how to apply the basic integration methods.

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 objectives: Knowing systems of linear equations and their matrix expression; knowing operations of matrices and determinant calculation; knowing different methods of solving systems of linear equations using matrices and determinants

BLOCK 3: Linear optimization. Operative investigation

Topic 5: Linear optimization. Operative investigation

- 5.1 Formulation and graphic resolution of mathematical programs
- 5.2 Optimization with equality constraints.
- 5.3 Lagrange multipliers.
- 5.4 Economic applications

Learning objectives: Formulate and properly graph mathematical programs; solve optimization problems with equality constraints; know other methods of optimization of functions with several variables.

5. TEACHING-LEARNING METHODOLOGIES

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

Listed below are the types of learning activities and the number of hours the student will spend on each one:

Campus-based mode:

Learning activity	Number of hours
Master classes	50h
Self-study	20h
Case study analysis and problem-solving sessions	40h
Group and collaborative activities and projects	20h
Knowledge test	10h
Tutoring hours	10h
TOTAL	150h

Online mode:

Learning activity	Number of hours
Virtual seminar	5h
Topics reading and complementary resources consulting	22.5h
Individual activities: problem, cases and projects	35h
Group and collaborative activities and projects	12.5h
Tutoring hours	17.5h
Self-assessment questionnaire and knowledge test	7.5h
Self-study	50h
TOTAL	150h

7. ASSESSMENT

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

Campus-based mode:

Assessment system	Weight
Knowledge test	50%
Written reports, case analysis and collaborative projects	20%
Solving problems, case analysis and individual projects	30%

Online mode:

Assessment system	Weight
Knowledge test	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:

Assessable activities	Deadline
Diagnostic test	0-2 week
Resolution of individual and/ or cooperative application exercises	1-3 week
Resolution of individual and/ or cooperative application exercises	4-7 week
Intermediate knowledge test	9-10 week
Resolution of individual and/ or cooperative application exercises	10-13 week
Collaborative week presentation	14-18 week
Resolution of individual and/ or cooperative application exercises	14-16 week
Intermediate knowledge test	16-17 week
Final Knowledge test	18-19 week

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

9. BIBLIOGRAPHY

The following reference books are useful. All of them are disposable for borrowing or consulting in the library of the university Dulce Chacón.

As an introduction and review:

- García Pineda y colb. 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.
- 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 necessary knowledge students are encourage to follow the leveling course BASIC STEAM-Matemáticas and review videos of the teaching videos AulaUE:

10. DIVERSITY MANAGEMENT UNIT

Curricular adaptations and adjustments for students with specific learning support needs, in order to guarantee equal opportunities, will be overseen by the Diversity Management Unit (UAD: Unidad de Atención a la Diversidad).

From this Unit, students are offered:

1. Accompaniment and follow-up by carrying out counseling and personalized plans for students who need to improve their academic performance.
2. In terms of attention to diversity, non-significant curricular adjustments are made, that is, at the level of methodology and evaluation, in those students with specific needs for educational support, thereby pursuing equal opportunities for all students.
3. We offer students different extracurricular training resources to develop various skills that will enrich their personal and professional development.
4. Vocational guidance by providing tools and advice to students with vocational doubts or who believe they have made a mistake in choosing the degree.

It is compulsory for this Unit to issue a curricular adaptation/adjustment report, and therefore students with specific learning support needs should contact the Unit at unidad.diversidad@universidadeuropea.es at the beginning of each semester.

11. ONLINE SURVEYS

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.