



FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura	
Subject name	Algebra
Subject code	E000012781
Main program	Grado en Análisis de Negocios / Business Analytics por la Universidad Pontificia Comillas
Involved programs	Grado en Análisis de Negocios/Bachelor in Business Analytics y Grado en Relaciones Internacionales [First year] Grado en Análisis de Negocios/Bachelor in Business Analytics y Grado en Derecho [First year] Grado en Análisis de Negocios/Bachelor in Business Analytics [First year] Grado en Admin. y Dirección de Emp. y Grado en Análisis de Negocios/Bachelor in Business Analytics [First year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Básico
Department	Departamento de Métodos Cuantitativos
Coordinator	David Roch Dupré
Office hours	Students will be informed on the first day of class.

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DATOS ESPECÍFICOS DE LA ASIGNATURA

Contextualización de la asignatura

Aportación al perfil profesional de la titulación

A graduate in Business Analytics must use data and analytical techniques to improve business decision-making. Thus, he/she must be able to abstract the essence of each problem in order to use the most appropriate analytical method to solve it. Algebra will provide students with skills that will help them in these tasks, because it will foster the ability to abstract and because it is the basis of many mathematical processes that they will have to use in the future.

Prerrequisitos

It is recommended that the students take the Mathematics course offered at the Pre-University Campus.

In case of not having the basic level necessary for the subject, students have the [E-LEARNING COMILLAS PREU-MAT](#) course on basic mathematics available online.

Competencias - Objetivos

Competencias

General Competencies

- CG02 Ability to analyze massive data from different sources: text, audio, numerical and image.
 - RA1 Being able to analyze and synthesize information received in mathematical language.
- CG03 Problem-solving and decision-making in an environment of massive quantitative and qualitative data.
 - RA1 To know the basic mathematical tools that enable them to pose and solve real problems in the business world.
 - RA2 Acquire the ability to make decisions with knowledge, initiative and critical spirit.
- CG09 Ethical commitment in the information society.
 - RA1 Pursue excellence in professional actions.
- CG11 Ability to learn and work autonomously in the information society.
 - RA1 Be able to apply the knowledge obtained in new contexts.
 - RA2 Be able to learn new methods and theories autonomously in their professional life.

Specific Competencies

- CE17 To acquire the ability to solve problems posed in the business environment using mathematical tools.
 - RA1 To know the basic tools of linear algebra

Resultados de Aprendizaje



Included in the previous section, being associated with the competencies.

BLOQUES TEMÁTICOS Y CONTENIDOS

Contenidos – Bloques Temáticos

Unit 0: Matrices

1. Introductory example
2. Matrices. Basic types
3. Operations with matrices
4. Square matrices
5. Rank of a matrix

Unit 1: Systems of Linear Equations

1. Introductory example
2. Systems of linear equations
3. Types of systems according to their solution
4. Rouché-Frobenius Theorem
5. Solving systems of linear equations

Unit 2: Vector Spaces

1. Introductory example
2. Definition of (Real) Vector Space (VS)
3. Linear combination of vectors. Linear Span.
4. Generating system of a vector space.
5. Linearly dependent/independent vectors
6. Basis of a VS. Dimension of a VS. Change of basis in a VS
7. Vector subspace (VSS)

Unit 3: Linear Maps

1. Definition of a linear map
2. Matrix expression of a linear map
3. Change of basis in a linear map



Unit 4: Endomorphisms and Diagonalization

1. Eigenvalues and eigenvectors. Determination and important theorems
2. Diagonalization of an endomorphism
3. Applications of diagonalization of endomorphisms.
4. Diagonalization of symmetric matrices

Unit 5: Quadratic Forms

1. Definition of quadratic form. Matrix expression.
2. Sign of a quadratic form.
3. Study of the sign of a quadratic form through eigenvalues.
4. Study of the sign of a quadratic form through principal minors.
5. Restricted quadratic forms

METODOLOGÍA DOCENTE

Aspectos metodológicos generales de la asignatura

Expository sessions always combine theory and solving exercises as an application of the theory.

Laboratories. There is only one preset session initially. As the classes develop, laboratories and computer practices will be incorporated into the classroom. Therefore, students will be asked to bring their computers to class

Metodología Presencial: Actividades

Expository sessions always combine theory and solving exercises as an application of that theory.

Laboratories. There is only one preset session initially. As the classes develop, laboratories and computer practices will be incorporated into the classroom. Therefore, students will be asked to bring their computers to class.

Metodología No presencial: Actividades

Tutorial sessions

Group activity

Completion of proposed exercises for personal study

RESUMEN HORAS DE TRABAJO DEL ALUMNO

Lessons:

- Lectures: 58 h
- Practical Seminars: 2h



Individual Work:

- Individual and/or group study and organized reading: 90 h

ECTS CREDITS: 6 (150 hours)

EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

Midterm Texts

- Three midterm tests throughout the course to motivate the student in his/her study and allow him/her to be aware of his performance.

Unjustified absence from any of the tests will result in a "zero".

Final Exam

It will contain questions of different types:

1. Theory exercises
2. Exercises to be solved with a computer

Calificaciones

Ordinary Examination:

The continuous evaluation will be 35% of the final grade (of which 5% corresponds to the first test, 10% to the second, and 20% to the third).

The final exam will form 65% of the final grade.

The final grade will be calculated as follows:

The final grade of a student who obtains at least 4.25 in the final exam will be calculated based on the continuous evaluation and the final, with the percentages as given above (that is, 65% of the final and 35% of the continuous evaluation).

The final grade of a student who obtains below 4.25 on the final exam will be the grade obtained on the final exam.

Extraordinary Examination:

The grade of a student who obtains at least 4.25 on the extraordinary exam will be the higher score of the following two options:

- Option a: Extraordinary exam (100%)
- Option b: 65% extraordinary exam and 35 % continuous evaluation.

The final grade of a student who obtains below 4.25 on the extraordinary exam will be the grade obtained on the extraordinary exam.

PLAN DE TRABAJO Y CRONOGRAMA

Activities	Date of realization	Delivery date
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Unit 0: Matrices MatLab Introduction and Installation	Week 1	
Unit 0: Matrices Unit 1: Linear systems of equations	Week 2	
Unit 1: Linear systems of equations Unit 2: Vector spaces I	Week 3	
Unit 2: Vector Spaces I	Week 4	
Unit 2: Vector Spaces II	Week 5	
Unit 2: Vector Spaces II	Week 6	
Unit 2: Vector Spaces III	Week 7	
Unit 3: Linear Maps	Week 8	
Unit 3: Linear Maps	Week 9	
Unit 4: Diagonalization	Week 10	
Unit 4: Diagonalization	Week 11	
Unit 4: Diagonalization	Week 12	
Unit 5: Quadratic forms	Week 13	
Unit 5: Quadratic forms	Week 14	

BIBLIOGRAFÍA Y RECURSOS

Bibliografía Básica

- Giménez Abad, M^ªJ., Martín Antón, G. y Serrano Rey, A.: Matemáticas para ADE: Teoría y Ejercicios. Editorial Pearson. 2014
- De la Villa, A. (2010) Problemas de álgebra. Ed. CLAGSA. Madrid



COMILLAS

UNIVERSIDAD PONTIFICIA

ICAI

ICADE

CIHS

Syllabus
2024 - 2025

Bibliografía Complementaria

Lay, D. C. (2003). *Linear algebra and its applications*. Pearson Education India.