

27502 - Mathematics I

Syllabus Information

Academic Year: 2021/22

Subject: 27502 - Mathematics I

Faculty / School: 109 - Facultad de Economía y Empresa

Degree: 449 - Degree in Finance and Accounting

ECTS: 6.0

Year: 1

Semester: First semester

Subject Type: Basic Education

Module:

1. General information

2. Learning goals

3. Assessment (1st and 2nd call)

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

The methodology followed in this course is oriented towards the achievement of the learning objectives. The objective of this subject is that the students should develop the analytical skills, rigour and intuition needed for using mathematical concepts and results and that they should be able to apply these abilities to the analysis of problems of an economic nature. Therefore, the teaching should aim to provide students with a solid mathematical knowledge and to train them in a way of reasoning that will allow them thereafter to successfully solve a wide variety of questions in an economic scenario.

A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, seminars, autonomous work and study.

Students are expected to participate actively in class throughout the semester.

Further information regarding the course will be provided on the first day of class.

4.2. Learning tasks

The course includes the following learning tasks:

- Lectures in which the professor explains the concepts and results corresponding to the contents. At the same time, some exercises will be solved with the participation of the students to help them comprehend the theoretical concepts presented. These classes are face-to-face and will be given to the full group. Time allotted: 1.2 ECTS credits (30 hours).
- Practice sessions, in which the students will apply the theoretical results in order to solve, with the professor's help, more complete exercises, and problems of an economic nature. Problem sheets will be available for the students and the professor will announce in advance the problems that will be solved in each practice sessions so that the students can prepare them beforehand. These classes are face-to-face and will be given separately to each subgroup. Time allotted: 1.2 ECTS credits (30 hours each subgroup).
- Seminars (practical classes P6), which may consist of a number of different activities designed to support the

learning process, including: follow-up of some simple projects that had been assigned to small teams of students and the presentation of these projects; answering questions that students may have regarding some of the contents taught; solving problems of an economic nature by using some of the mathematical tools taught during the classes, etc. These seminars may also be devoted to the teaching of more advanced topics, intended for the students interested in learning some further mathematical tools that would allow them to deal with more general problems. In this way, the students are shown that both Mathematics and Economics are vibrant sciences with many facets to be studied.

- Autonomous work: 3.6 ECTS credits.

The teaching methodology is expected to be face-to-face. However, if for public health reasons it were necessary, the classes might take place online.

4.3. Syllabus

The course will address the following topics:

- Chapter 1. Matrices
 - 1.1. Determinants. Applications: calculation of the rank of a matrix, calculation of the inverse matrix and Cramer's Rule
 - 1.2. \mathbb{R}^n : Spanning sets. Basis.
 - 1.3. Diagonalization of square matrices
 - 1.3.1 Eigenvalues and eigenvectors of a square matrix: definition and calculation.
 - 1.3.2. Diagonalization of a square matrix.
 - 1.3.3. Application to the calculation of matrix powers
- Chapter 2. Real quadratic forms
 - 2.1. Quadratic forms: definition. Matrix expression and polynomial expression.
 - 2.2. Diagonal expression of a quadratic form.
 - 2.3. Classification of a quadratic form according to its sign.
 - 2.4. Constrained quadratic forms.
- Chapter 3. Functions from \mathbb{R}^n to \mathbb{R}^m
 - 3.1. Preliminaries: topological concepts.
 - 3.2. Functions: domain, range and graph. Level sets of scalar functions.
 - 3.3. Continuity of a function.
 - 3.4. Differentiation of a function. Partial derivatives. Gradient vector. Jacobian matrix.
 - 3.5. Differentiability. Directional derivative of differentiable functions.
 - 3.6. Differentiation of composed functions: Chain's Rule. Tree diagrams.
 - 3.7. Higher order derivatives. Schwarz's Theorem. Hessian matrix. Taylor's Theorem.
 - 3.8. Implicit function Theorem. Differentiation of implicit functions.
 - 3.9. Homogeneous functions. Euler's Theorem.
 - 3.10. Basic integration methods of function of one variable. Barrow's Rule.

4.4. Course planning and calendar

Further information concerning the timetable, classroom, office hours, assessment dates and other details regarding this course, will be provided on the first day of class or please refer to the Faculty of Economics and Business website (<https://econz.unizar.es/>)