27602 - Mathematics I

Syllabus Information

Academic Year: 2019/20
Subject: 27602 - Mathematics I
Faculty / School: 109 - Facultad de Economía y Empresa
Degree: 450 - Degree in Marketing and Market Research
ECTS: 6.0
Year: 1
Semester: First semester
Subject Type: Basic Education
Module: ---

1.General information

1.1.Aims of the course

1.2.Context and importance of this course in the degree

1.3.Recommendations to take this course

2.Learning goals

2.1.Competences

2.2.Learning goals

2.3.Importance of learning goals

3.Assessment (1st and 2nd call)

3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

4.Methodology, learning tasks, syllabus and resources

4.1.Methodological overview

The objective of this course is that the students develop the analytical skills, rigor and intuition needed for using mathematical concepts and results. As a result, they should be able to apply these abilities to the analysis of problems of an economic nature. Therefore, the teaching methodology should 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.

4.2.Learning tasks

The course includes the following learning tasks:

- **Lectures (30 hours: 1.2 ECTS).** Sessions in which the teacher will present the concepts and results corresponding to the course contents. Some exercises will be solved with the participation of the students to help them comprehend/understand the theoretical concepts. These classes are face-to-face and will be given to the whole group.
- **Practice sessions (30 hours: 1.2 ECTS).** Sessions in which the students will apply the theoretical results in order to solve, with the teacher's help, more complex exercises, and problems of an economic nature. Problem sets will be available for the students and the teacher will announce in advance the problems that will be solved in each session so that the students can prepare them beforehand. These classes are face-to-face and will be given separately to smaller groups of students.

- **Seminars P6.** They may consist of a number of different activities designed to support the learning process, including: follow-up of some simple projects that are 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).**

4.3.Syllabus

Chapter 1. Matrices

1.1. Determinants. Applications: calculation of the rank of one matrix, calculation of the inverse matrix and Cramer's Rule.

1.2. Rn:Generating systems. 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 Rn to Rm

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 ?Facultad de Economía y Empresa? website.

4.5.Bibliography and recommended resources