

**Información del Plan Docente**

<b>Academic Year</b>	2016/17
<b>Academic center</b>	109 - Facultad de Economía y Empresa
<b>Degree</b>	417 - Degree in Economics
<b>ECTS</b>	6.0
<b>Course</b>	1
<b>Period</b>	First semester
<b>Subject Type</b>	Basic Education
<b>Module</b>	---

**1.Basic info****1.1.Recommendations to take this course****1.2.Activities and key dates for the course****2.Initiation****2.1.Learning outcomes that define the subject****2.2.Introduction****3.Context and competences****3.1.Goals****3.2.Context and meaning of the subject in the degree****3.3.Competences****3.4.Importance of learning outcomes****4.Evaluation****5.Activities and resources****5.1.General methodological presentation**

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.

**5.2.Learning activities**

## 27402 - Mathematics I

The program offered to the students to help them achieve the learning results includes the following activities:

**1. Theoretical lessons** which will be based on lectures to present 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).

**2. Practical lessons**, in which the students will apply the theoretical results in order to solve, with the teacher's help, more complete exercises, and problems of an economic nature. Problem sheets will be available for the students and the teacher will announce in advance the problems that will be solved in each practical lesson 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).

**3. 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.

Time allotted: Subject to an agreement of *the Junta de Facultad*.

**4. Out of class work** : 3.6 ECTS credits.

### 5.3.Program

The contents detailed in the program below will be developed in the theoretical and practical classes. Any variations in the order in which the topics will be taught will be indicated by the teacher in the presentation of the subject.

#### PART I. MATRICES

##### **1. Matrices, determinants, and systems of linear equations.**

1.1. Elementary matrices

1.2. Determinant of a square matrix.

1.3. Matrix inversion.

1.4. Rank of a matrix.

1.5. Systems of linear equations.

**2. Diagonalisation of square matrices.**

2.1. Preliminary concepts: Set  $\mathbb{R}^n$ .

2.1. Eigenvalues and eigenvectors of a matrix.

2.3. Diagonalisable matrices.

2.3. Symmetric matrices.

3. Real quadratic forms.

3.1. Quadratic forms: definitions.

3.2. Diagonal form of a quadratic form.

3.3. Classification of quadratic forms.

3.4. Restricted quadratic forms.

**PART II. DIFFERENTIAL AND INTEGRAL CALCULUS****4. Real-valued functions of one real-valued variable.**

4.1. Real-valued functions of one real-valued variable.

4.2. Limits and continuity.

4.3. Differentiability.

4.4. Higher-order derivatives. Taylor's theorem.

5. Introduction to the theory of integration

5.1. Indefinite integral.

5.2. Primitive function and indefinite integral. Properties.

5.3. Some techniques of integration: change of variables, integration by parts, and integration of rational functions.

5.4. Definite integral.

5.5. Riemann integral. Properties.

5.6. Applications.

6. Functions from  $\mathbb{R}^n$  to  $\mathbb{R}^m$ .

6.1. Basics of Topology in  $\mathbb{R}^n$ .

6.2. Scalar-valued and vector-valued functions. Level set.

6.3. Limits and continuity. Properties.

6.4. Derivatives of a function. Properties.

6.5. Differentiable function. Properties.

6.6. Function composition. Chain rule.

6.7. Higher-order derivatives.

6.8. Derivatives of implicit functions.

6.9. Homogeneous functions.

## **5.4.Planning and scheduling**

In the first session of the semester it will be presented in each group the detailed schedule of the subject according to the characteristics of the academic year.

## **5.5.Bibliography and recommended resources**

The recommended readings are usually available in the University Library's data base (go to 'bibliografia recomendada' in 'biblioteca.unizar.es').