# Mathematics for Economics I

**Academic Year: ( 2020 / 2021 )** **Review date: 10-07-2020**

**Department assigned to the subject: Economics Department**

**Coordinating teacher: NUÑEZ SANZ, CARMELO**

**Type: Compulsory ECTS Credits : 6.0**

**Year : 1 Semester : 1**

**Branch of knowledge: Engineering and Architecture**

## OBJECTIVES

This subject provides the quantitative instruments that are needed to pose and analyze economic problems with the aid of a formal model.

In working towards the above goal the student will acquire the following competences and skills.

Regarding the contents of the course, the student will be able of:
- Study the concept of one variable function and the different properties that a function may enjoy or not.
- Understand the basic tools of calculus.
- Pose and solve static optimization problems.
- Apply all the above concepts to economic problems.

We classify the competences in two groups: specific competences and generic competences or skills.

Regarding the specific competences, the student will be able to:
- Solve equations, sometimes exactly and sometimes approximately.
- Understand the fundamental concepts involved in the calculus of functions: continuity, differentiability and integration.
- Describe geometrically the qualitative properties of the functions of one variable, such as growth, concavity and convexity.
- Approximate a function of one variable using the Taylor polynomial.
- Pose and solve static optimization problems, using the first and second order conditions.

Pertaining the general competences or skills, in the class the student will develop:
- The ability to address economic problems by means of abstract models.
- The ability to solve the above formal models.
- The ability to interpret and classify the different solutions and apply the appropriate conclusions to social contexts.
- The ability to use the basic tools that are need in the modern analysis of economic problems.

Throughout the course, the student should maintain:
- An inquisitive attitude when developing logical reasoning, being able to tell apart a proof from an example.
- An entrepreneurial and imaginative attitude towards the cases studied.
- A critical attitude towards the formal results and their applicability in social contexts.

## DESCRIPTION OF CONTENTS: PROGRAMME

The course studies theory of functions of one variable. In particular, we focus on the properties of continuity, derivability, and integration of functions. As soon as the student understands these concepts, they are applied to the study of problems of interest in Economy, such as monotony and convexity, graphic representation, polynomial approximation, optimization and calculus of areas.

The program is divided in five big lessons:
Lesson 1: elementary properties of functions. In particular, it is studied when a function is periodic, monotone, shows symmetries or has an inverse.
Lesson 2: continuity. In particular, it is studied when a function has limits and /or asymptotes, the calculus of intersection points of graphics and the existence of maxima and minima.
Lesson 3: differentiability, part one. We study the calculus of derivatives, stressing implicit

differentiation. In the same way, we apply derivatives to study monotony and the calculus of maxima and minima.
Lesson 4: differentiability, part two. We use the concept of derivative to compute limits, to approximate locally a function by polynomials, to characterize concavity and convexity of a function and for an introductory study of the income, cost and profit functions.
Lesson 5: Integration. First of all, we introduce the concept of primitive of a function, and we study different methods of computing them. Secondly, we introduce the concepts of area and integral, and its relationship with the concept of primitive function. In a third step, we study the calculus of areas. Finally, we study improper integrals.

## LEARNING ACTIVITIES AND METHODOLOGY

The course lectures will be based on combining theoretical explanations with several practical exercises. The students should attempt to solve the exercises by themselves, before they are addressed in class.

Student participation is considered very important in order to acquire the skills needed to pose and solve economic models.

## ASSESSMENT SYSTEM

The student will get a class note that will reflect the work done along the semester.

The final grade will be obtained adding the class note (up to 4 points) and the note of the final exam (up to 6 points).
The final exam is the same for all the groups of the subject with the same schedule (cronograma) and consists of practical exercises and theoretical questions.
The class grade is determined by:
a) up to 3 points, obtained from the two quizzes done in the reduced group.
The quizzes will be held at the end of lesson 2 and at the end of lesson 4.
The quizzes mentioned before will be notified in advance with enough time.
b) up to 1 point, obtained from the exercises that will be done eventually during the classes, both magistral and reduced.

Ordinary call: The final grade is obtained adding up the grade in the final exam and the class grade.

Extraordinary call: The final grade is the maximum of the following grades:
a) The sum of the class note, and the extraordinary final exam grade, valuing that exam over 6.
b) The extraordinary final exam grade, valuing that exam over 10.

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| **% end-of-term-examination:** | 60 |
| **% of continuous assessment (assigments, laboratory, practicals…):** | 40 |

## BASIC BIBLIOGRAPHY

- Larson, Hostetler & Edwards Calculus. English edition, McGraw-Hill.