Introduction to Mathematics for Economics

Academic Year: (2022 / 2023) **Review date: 03-10-2022**

Department assigned to the subject: Economics Department

Coordinating teacher: NUÑEZ SANZ, CARMELO

Type: Compulsory ECTS Credits : 3.0

Year : 1 Semester : 1

OBJECTIVES

This subject introduces the quantitative instruments that are needed to approach intiutively to economic problems.

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 differential calculus.
- Pose and solve static optimization problems.
- Synthesize all the information you have about a function in its graph.
- Apply all the above mathematical concepts to the solution of economic problems.

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

Regarding the specific competences, at the end of the semester the student will be able to:
- Find out what propierties a function of one variable has or has not.
- Solve equations, sometimes exactly and sometimes approximately.
- Describe geometrically the qualitative properties of the functions of one variable, such as continuity, differentiability and concavity.
- Approximate a function of one variable using the Taylor polynomial.
- Pose and solve static optimization problems, using the first and second order conditions.
- Approximate a function at infinity using its asymptotes and its properties of concavity or convexity.

In relation to the general competences or skills, during the semester the student will develop:
- The ability to pose a problem, carefully interpreting the data.
- The ability to choose which of the available mathematical tools is the right one.
- The ability to distinguish among the non-existence of solution, the existence of solution with approximate value and the existence of solution with exact value.
- The ability to interpret and classify the different solutions of a problem.and apply the appropriate conclusions to social contexts.
- The ability to obtain the right conclusions of each solution for the different economic problems.

Throughout the course, the student should maintain:
- A rigorous attitude when developing logical reasoning, being able to tell apart a proof from an example.
- A critical attitude towards the results studied, always true in the mathematical world, but not that much in the social sciences world.
- An imaginative attitude towards new problems and concepts, as well as their applicability in social sciences.

DESCRIPTION OF CONTENTS: PROGRAMME

The course studies theory of functions of one variable. In particular, we focus on the properties of monotonicity, continuity, derivability, and concavity/convexity of functions. As soon as the student understands these concepts, they are applied to the study of problems of interest in Economy, such as graphic representation, approximation by asymptotes, local approximation by polinomials and optimization.

The program is divided in four 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, both local and global.
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.

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, both inside and outside the classroom.

The final grade is the weighted average of the final exam and the class grade. The final exam is the same for all the groups of the subject and consists of practical exercises and theoretical questions. The class grade is determined by the teachers of the corresponding magistral and reduced groups.
The class quiz will be worth three of the four points of the class note. The remaining point will be obtained by the teachers of the magistral and reduced group taking into account several tasks during the course.
The quiz will be held during the tenth week of the course.

Ordinary call: The final grade is the weighted average of 60% the grade in the ordinary final exam and 40% the class grade.

Extraordinary call: The final grade is the maximum of the following grades:
a) A weighted average consisting of 60% the grade in the extraordinary final exam and 40% the class grade.
b) The grade in the extraordinary final exam.

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

BASIC BIBLIOGRAPHY

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