

Academic Year: ( 2022 / 2023 )

Review date: 22-06-2021

Department assigned to the subject: Economics Department

Coordinating teacher: RINCON ZAPATERO, JUAN PABLO

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Introduction to Mathematics for Economics or equivalent studies  
 Mathematics for Economics or equivalent studies

**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 toward the above goal the student will acquire the following competences and skills.

Regarding the contents of the course, the student will be able to:

- Analyze the concepts of linear and matricial algebra.
- Understand the basic tools of integral calculus in one and two variables.
- Understand elementary concepts of sequences and series of real numbers.
- 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 linear systems of equations and determine the number of parameters in the solution.
- Master the main tools for the calculus of primitives.
- Understand the concept of Riemann integral, its interpretation as area, and the relationship with the indefinite integral.
- Understand the concepts of convergence and divergence of sequences and series of real numbers.
- Understand the concept of improper integral and the method of calculus.
- Solve double integrals by means of change of variables and iterated integrals.
- know how to derive under the integral sign.

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.

Through out 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 consist of three parts: Linear Algebra, Sequences and Series, and integration of functions of one and two variables.

**Chapter 1: Matrices systems of linear equations**

- Matrices, determinants, inverse matrix, minors, equivalent echelon matrix and y rank of a matrix.
- Systems of linear equations: definitions and matricial form. Theorem of Rouché-Frobenius. Resolution of linear systems: Methods of Gauss and Cramer.

- Eigenvalues and eigenvectors of a matrix. Matrix diagonalization. Orthogonal diagonalization of symmetric matrices.
- Quadratic forms. Classification.

## Chapter 2: Integration of functions of one variable

- Calculus of primitives.
- Definite integral: properties. Derivative and integral: Fundamental Theorem of Calculus and Barrow's Rule. Continuity and integral: Mean Value Theorem for integrals.
- Area and integral. Exact and approximated calculus of the area of a bounded region in the plane.

## Chapter 3: Improper integrals of one variable, sequences and series

- Improper integrals: convergence tests.
- Sequences and limits: convergence tests.
- Series and limits: convergence tests.
- Harmonic and geometric series.

## Chapter 4: Integration of functions of two variables

- Double integral on rectangles and on bounded sets.
- Iterated integrals. Fubini's Theorem.
- Transformation of integrals.
- Derivation under the integral.

## 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 final grade is the weighted average of the final exam and the class grade. The final exam is the same for all the Mathematics for Economics II groups and consists of practical exercises and theoretical questions. The class grade is determined by each professor and is based on quizzes done in the classes.

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

Extraordinary exam: The final grade is the maximum of the following grades:

- A weighted average consisting of 60% the grade in the final exam and 40% the class grade.
- The grade in the final exam.

<b>% end-of-term-examination:</b>	60
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	40

## BASIC BIBLIOGRAPHY

- R. E. Larson, R. P. Hostetler y B. H. Edwards Calculus (Vol. I). English edition, McGraw Hill.
- R. E. Larson, R. P. Hostetler y B. H. Edwards Calculus (Vol. II). English Edition., McGraw Hill.

## ADDITIONAL BIBLIOGRAPHY

- K. Sydsaeter, P. J. Hammond Essential Mathematics for Economic Analysis, Prentice Hall.