Universidad de Navarra

Quantitative Methods II A_20 (F. Económicas)

Guía docente 2023-24

PRESENTATION

Description of the course: The objective of this course is to provide the basic elements of linear algebra and optimization, necessary for learning other subjects of the degrees in Economics and Business Administration and Management.

The subject is essential to understand and use the quantitative economic models and to solve complex problems with many variables (impossible to synthesize intuitively). In addition, the subject helps to streamline reasoning, structure the mind, facilitate abstract thinking and the capacity for interrelation.

Facultad: School of Economics and Business

Department: Economics

ECTS: 6 (150 h)

Year: 1º

Semester: 2º

Language: English

Start and ending dates: according to the academic calendar

Schedule:

Group A: Tuesday 10-12h (Room ICS-PO Siemens Gamesa) and Thursday 12-14h (Room 16)

Professors: David Rivero, driverol@unav.es, office 2020

COMPETENCES

Basic:

BC1: Students must demonstrate that they possess and understand knowledge in an area of study based on a general secondary school education whose content often comes from advanced textbooks, but also includes cutting-edge

General skills:

GC4: To use independent critical reasoning on relevant topics in economics and business.

PROGRAMME*

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Block 1: Linear Algebra

Chapter 1: Matrices, determinants and systems

1.1.Definition of matrix

1.2 Operations with matrices

1.3 Special kinds of matrices

1.4 Determinant of a matrix

1.5 Rank of a matrix

1.6 Invertible matrices

1.7 Systems of linear equations

1.8 Systems of nonlinear equations

Chapter 2: Applications of matrices and systems

2.1 Matrix applications

2.2 Applications of systems of equations

Chapter 3: Linear programming

3.1 Introduction

3.2 Structure of a linear programming problem

3.3 Graphical solution. Feasible region

3.4 Types of solutions in a linear programming problem

3.5 Vertex solutions

Block 2: Multivariate Calculus and Optimization

Chapter 4: Multivariate functions and differentiability

4.1 Functions of two variables

4.2 Functions of several variables

4.3 Derivatives of multivariate functions. Partial Derivatives

4.4 The Chain Rule

4.5 Implicit function theorem

4.6 Homogeneous and Homothetic functions. Euler's Theorem

4.7 Linear approximations. Differentials

4.8 Partial Derivatives Applications

Chapter 5: Unconstrained optimization

5.1 Functions of two variables

5.2 Critical points of a function

5.3 Extreme Value Theorem

5.4 Second order conditions, maxima and minima of a function

5.5 Convex sets. Convex and Concave functions

5.6 Second derivative tests for concavity and convexity

5.7 Envelope theorem for unconstrained problems

Chapter 6: Optimization with equality constraints

6.1 Formulation of the problem

6.2 The substitution method

6.3 The Lagrange multiplier method

6.4 The meaning of the multiplier

6.5 Sufficient conditions

6.6 General Lagrangian problems.

6.7 Envelope theorem for constrained problems

Chapter 7: Optimization with inequality constraints

7.1 Kuhn-Tucker method for one inequality constraint

*Note: The order of some contents of the proposed Syllabus is subject to change.

ACTIVITIES

In this section the overall methodology of the subject is detailed and the student's workload hours are estimated. There will be face-to-face and non-face-to-face activities. ´

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Face-to-face classes: (60 total hours)

a)Theoretical classes. 15 classes of 2 hours, the most important points of each topic from the notes of the subject given by the teacher will be exposed. The theory of the subject will be explained with examples and economic applications.

b) Practical classes. 15 classes of 2 hours. Key problems of advanced difficulty of the different topics are solved. Students will be divided into 2 groups to attend one face-to-face class per week.

Office hours:

During each week of the course and according to the academic calendar, there will be 3 hours dedicated to online office hours at the time indicated in the office hours section. These office hours may be used to resolve doubts raised by students

Personal study: (84 hours)

The main non-presential activity will be the personal study of the subject.

The minimum number of hours estimated is 75, although this number may be increased depending on the level of the student and their prior knowledge of the subject.

Evaluation: (6 hours)

It corresponds to the hours of the exam and the hours of tests in class. In total, throughout the course, there will be 9 hours of written exam (partial and final).

EVALUATION

Honesty Policy

We value honesty. There can be no trust or meaningful social relationships without it. Therefore, the Faculty expects honesty and justice from all its members: professors, administrative staff and students. The dishonesty will be sanctioned in accordance with the University Norms on the Academic Discipline of Students of August 2015 that include lying, cheating on exams, and plagiarism of written works. We take these offenses seriously. Depending on its severity, the subject teacher, the vice-dean of students, and in very serious cases, the vice-rector of students will be in charge of its sanction.

Sanctions include:

• formal reprimands

• expulsion from the University for a period

• loss of examination session

• Loss of scholarships suspended in the grade of the work or the subject

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Ordinary evaluation:

SE1. Continuous work in the subject (5%): In the practical classes, exercises will be proposed to be solved, which must be submitted at the end of the class. They will account for 5% of the final grade in the regular assessment.

SE2. Partial evaluation of theoretical and practical contents of the subject (45%):

There will be two surprise exams with a maximum duration of 2 hours in class. Each of them will account for 10% of the final grade in the ordinary assessment. Additionally, there will be a longer midterm exam (3 hours) that will account for 25% of the final grade in the regular assessment.

SE3. Final evaluation of theoretical and practical content (50%):

It will cover all the subject. It will have a value of 50% of the final grade of the ordinary evaluation and will consist of taking a 3-hour exam.

The student should obtain at least a 4 in the final exam to be averaged with the rest of the grades in the subject.

Extraordinary evaluation:

In case of not passing the subject and using the extraordinary evaluation, the percentages of the evaluation system will become:

SE1. Continuous work in the subject (5%): In the practical classes, exercises will be proposed to be solved, which must be submitted at the end of the class. They will account for 5% of the final grade in the extraordinary assessment.

SE2. Partial evaluation of theoretical and practical contents of the subject (25%):

There will be two surprise exams with a maximum duration of 2 hours in class. Each of them will account for 5% of the final grade in the extraordinary assessment. Additionally, there will be a longer midterm exam (3 hours) that will account for 15% of the final grade in the extraordinary assessment.

SE3. Final evaluation of theoretical and practical content (70%):

It will cover all the subject. It will have a value of 70% of the final grade of the extraordinary evaluation and will consist of taking a 3-hour exam.

The student should obtain at least a 4 in the final exam to be averaged with the rest of the grades in the subject.

OFFICE HOURS

Prof. David Rivero, Office 2020, Wednesday from 16 to 19h.

REFERENCES

Universidad de Navarra

Bibliography and resources

Quantitative Methods II for Economics and Business Administration Students. Ignacio Rodríguez & Anastasia Terskaya.

Matemáticas para la Economía. Jarne G., Pérez-Grasa I., Minguilllón E. Ed. McGraw Hill. Localízalo en la Biblioteca

Mathematics for Economists. Carl P. Simon and Lawrence Blume. WW Norton & Co. Find it in the library

Essential Mathematics for Economic Analysis. Knut Sydsaeter, Peter Hammond, Arne Strøm and Andrés Carvajal. Fifth Edition. Ed. Pearson. Find it in the library

Complimentary Bibliography

Matemáticas para la Economía. Programación Matemática y Sistemas Dinámicos. Isabel Pérez-Grasa, Esperanza Minguillón, Gloria Jarne. Ed. McGrawHill. Localízalo en la Biblioteca

Fundamental methods of mathematical economics/Alpha C. Chiang, Kevin Wainwright. Boston, Mass.: McGraw-Hill/Irwin. Localízalo en la Biblioteca