Universidad de Navarra

Quantitative Methods II C_20

Guía docente 2023-24

PRESENTACIÓN

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

Deparment: Economics

ECTS: 6 (150 h)

Year: 1º

Semester: 2º

Language: English

Start and ending dates: according to the academic calendar

Classroom, schedule: Mondays AMI-S1-Aula B1 from 10:00 - 12:00 hours. Thursdays AMI-P0-Aula 10 from 8:00 - 10:00 hours.

Teachers: Maria Galarza-Heras, mgalarza@unav.es office 3060 and Andrea Celico, acelico@unav.es, TBA

COMPETENCES

Basic:

CB1) That students have demonstrated to possess and understand knowledge in an area of study that starts from the base of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects involving knowledge from the cutting edge of your field of study

CB5) That students have developed those learning skills necessary to undertake further studies with a high degree of autonomy

General skills:

CG3) Mastering computer, mathematical or technical tools relevant to academic and professional activity in economic and business matters.

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CG5) Reason autonomously and critically on issues relevant to the economic and business

Specific competences (ADE):

CE10) Apply mathematical reasoning and / or quantitative tools to solve problems associated with decision-making in the company

PROGRAM

Part 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 Mathematical model: 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

Part 2: Multivariate Calculus and Optimization

Chapter 4 Multivariate functions

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.**

EDUCATIONAL 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.

Face-to-face classes: (60 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.

Office hours:

During each week of the course and according to the academic calendar, there will be 2 hours dedicated to office hours at the time indicated in the office hours section. These office hours may be used to resolve doubts raised by students.

Evaluation: (9 hours)

It corresponds to the hours of the exam and the hours of tests in class.

EVALUACIÓN

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 which 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

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 subjects. 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.

CONVOCATORIA EXTRAORDINARIA

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

Dra. María Galarza-Heras (mgalarza@unav.es)

- Office 3060 Torre Edificio Amigos.
- Hours: To be determined.

Andrea Celico (acelico@unav.es)

Universidad de Navarra

- **Upon registration:** Link to register here (Google Drive sheet)
- Location: Seminar 19
- Hours: Friday 08:00-10:00

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