COURSE DATA

DATA SUBJECT

Code: 36110
Name: Mathematics II
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1316 - Degree in Economics	Facultat d'Economia	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1316 - Degree in Economics	Mathematics	BASIC

COORDINATION

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SUMMARY

"MATHEMATICS II" is a six-month basic subject that is taught in the first year, second semester, of the Degree in Economy.

In this subject the basic concepts and techniques of mathematical optimization are developed with the objective of providing the student with the appropriate mathematical tools in order to deal with the problem of assigning scarce resources to different alternative uses. Mathematical optimization techniques are needed to approach the theory of the firm, consumer theory, growth models, etc. Thus, the first topic of this subject introduces terminology and basic concepts of optimization. In the following topics, this knowledge is expanded and resolution techniques are developed so that, when faced with a practical real situation, the student knows how to formulate it, solve it, and interpret the obtained results.

Once the basic concepts have been introduced, non-linear programming is approached as the most general optimization problem, where interesting particular cases are addressed, such as unconstrained problems, problems with equality constraints (classical programming), and problems with non-negative variables, as well as the general case with constraints defined by inequalities. From topic 3, linear programming is addressed, where the fact that all the functions are linear allows the use of efficient methods different from those presented for the general case. The linearity also allows us to analyse the solution of the problem in a more complete way, by means of duality and sensitivity analysis. The special case where the problem variables can take only integer values is studied in the last topic.

The relevance of these problems and their frequent appearance in the economics and business world makes the capacities for abstraction, synthesis, and analysis for the right evaluation of the situation and the problem statement, as well as the knowledge of the resolution and analysis methods, fundamental skills that a good economics graduate must possess and that, in addition, are very well worth in the labour market.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

There are no specified enrollment restrictions with other subjects of the curriculum.

OTHER REQUIREMENTS

The knowledge corresponding to the subject Mathematics I is taken for granted. This knowledge includes: basic concepts of analysis (among them, partial derivatives calculation, gradient vector and Hessian matrix), graphical representation with two variables, and calculation of a inverse matrix.

COMPETENCES / LEARNING OUTCOMES

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Apply the principles of economic analysis (rational decision) to the diagnosis and resolution of problems.

Be able to collect and analyse information.

Be able to learn autonomously.

Be able to use ICTs.

Be able to work in a team (including interdisciplinary teams).

Have decision-making skills and be able to apply knowledge to practice.

Know and understand the basic quantitative tools for economic analysis, diagnosis and prospection, such as mathematics, statistics and econometrics.

Understand and apply the scientific method, which involves formulating hypotheses, deducing verifiable results and contrasting them with empirical and experimental evidence.

DESCRIPTION OF CONTENTS

1. Introduction to optimization

Introduction: the problem and its parts. Basic concepts: feasible solution, classes of optimum and classification of problems. Convexity. Basic theorems. The modeling process. Syntax of the computer program.

2. Non-linear programming

Introduction. Kuhn-Tucker conditions. Basic theorems of non-linear programming. Interpretation of Kuhn-Tucker multipliers. Modeling, interpretation and computer resolution of non-linear programming models: existence and globality of the solution and interpretation of the multipliers.

3. Introduction to linear programming

The linear problem: Types of solutions. Basic feasible solutions. Fundamental theorems of Linear Programming. Modeling, computer resolution and interpretation of linear programming models. Advanced syntax of the computer program.

4. Simplex method

Introduction. Simplex algorithm. Modeling, computer resolution and interpretation of linear programming models: type of solution and interpretation of the reduced cost.

5. Sensitivity and post-optimización analysis

Introduction. Sensitivity and post-optimization objective function coefficients and right hand sides. Introducing new variables. Modeling and computer resolution of linear programming models: sensitivity analysis.

6. Integer linear programming

Introduction. General formulation of linear integer problems. Method of branch and bound. Modeling, computer resolution and interpretation of linear integer programming models.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	30,00
Computer classroom practice	30,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	9,00
Independent study and work	15,00
Preparation of lessons	35,00
Preparation for assessment activities	31,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

Lectures:

The teacher will highlight the main aspects and those more difficult to understand, perform exercises and the study guide students through the materials available in the virtual classroom and reference manuals. After the class, the materials needed for the next class will be indicated, so that students can prepare for the session.

Practical classes:

Practical classes primarily will address issues related to modeling, computer resolution and interpretation, applying all relevant theory, of the results obtained. Professor will solve some previously proposed models and will perform other for subsequent classes. In each class, students should be able to defend the adequacy of its own model and to take decisions in the light of the results.

Theoretical and practical classes are completed with the proposed individual and/or group exercises which shall be modeled, will solve with a computer and they will interpret solutions to problems in the field of economics and business.

EVALUATION

a) Continuous assessment (5 points)

It is based on the student's attendance, participation and involvement in the teaching-learning process and in the practical activities carried out by the student during the semester, including individual and group work, and the defense of the positions developed by the student.

It consists of the study of practical cases, their mathematical modeling, their resolution with computer and the interpretation and discussion of the results obtained and, if appropriate, it can also contain theoretical-practical exercises.

b) Final exam (5 points)

The final exam will consist of solving theoretical-practical problems.

To pass the subject it will be necessary to obtain at least 2 points in the final exam, at least 2 points in the continuous assessment, and the sum of both marks must be at least 5 points. If the student does not reach the minimum required mark in one of the parts, the final mark will not be greater than 4.5 points.

In the first call and, if necessary, in the second one, the student will have to take the final exam (5 points). Voluntarily, on that same date, he/she will be able to take a retake exam (5 points) corresponding to the contents of the continuous assessment.

In both calls, in order to retake the continuous asesssment, the teacher may require the student to request it by email at least 5 days in advance.

REFERENCES

Basic

- Calvo, C. y Ivorra, C. (2024): Introducción a la programación matemática para titulaciones de economía y empresa (http://www.uv.es/~ivorra).
- Font, B (2009): Programación matemática para la economía y la empresa. 2ª Edición. Laboratori de Materials, 1. Valencia, PUV.
- Meneu, R. (2016): Apunts de teoria de Matemàtiques II (http://roderic.uv. es/handle/10550/50610).
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- Mocholí, M y Sala R (1993): Programación Lineal: Metodología y problemas. Madrid, Tebar Flores.
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• Vídeos docents de Matemàtiques II (2018). Projecte d'Innovació Docent "Preferències en l aprenentatge de lassignatura Matemàtiques II: Docència inversa i presencial amb aprenentatge cooperatiu" (Bas M.C, Sala-Garrido R., Meneu-Gaya R., Marín M.J., Benítez R.) MMedia UV.

Additional

• Arévalo, M. T., Camacho, E., Mármol, A. y Monroy, L. (2004): Programación matemática para la economía. Madrid, Delta Publicaciones.

• Barbolla, R., Cerdá, E. y Sanz, P. (2001): Optimización: Cuestiones, ejercicios y aplicaciones a la economía. Madrid, Pearson Education, Prentice Hall.

• Hillier, F. S. y Lieberman, G. J. (2002): Investigación de operaciones (7ª Edición). México, McGraw-Hill.

• Mocholí, M. y Sala, R. (1999): Decisiones de optimización (2ª Edición). Valencia, Tirant lo Blanch.

• Taha, H. A. (2004): Investigación de operaciones (7ª Edición). México, Pearson Education, Prentice Hall.