COURSE DATA

DATA SUBJECT

Code: 35817
Name: Mathematics II
Cycle: Undergraduate Studies / OCU Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1313 - Degree in Business Management and Administration	Facultat d'Economia	1	Second quarter
1330 - Degree in Business Management and Administration (Ontinyent)	Facultat d'Economia	1	Second quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1313 - Degree in Business Management and Administration	Mathematics	BASIC
1330 - Degree in Business Management and Administration (Ontinyent)	Mathematics	BASIC

COORDINATION

FONT BELAIRE MARIA BEGOÑA

SUMMARY

"MATHEMATICS II" is a compulsory six-month basic subject that is taught in the first year, second semester, of the Degree in Business Administration and Management.

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 topics of this subject introduce 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 real practical 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 analyzing the solution of the problem in a more complete way, by means of sensitivity analysis. The special case in which 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 make the capacities for abstraction, synthesis, and analysis for the proper assessment of the situation and the problem statement, as well as the knowledge of the resolution and analysis methods, fundamental skills that a good graduate in Business Administration and Management must possess and that, in addition, are highly valued in the labor 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 the inverse of a matrix.

COMPETENCES / LEARNING OUTCOMES

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Be able to adapt to new situations.

Be able to analyse and search for information from different sources.

Be able to apply analytical and mathematical methods for the analysis of economic and business problems.

Be able to define, solve and present complex problems systemically.

Be able to express oneself in formal, graphic and symbolic languages.

Be able to learn autonomously.

Be able to make decisions.

Be able to negotiate and reconcile interests effectively.

Be able to plan, organise, control and evaluate the implementation of business strategies.

Be able to solve problems.

Be able to transmit and communicate complex ideas and approaches to both specialised and lay audiences.

Be able to understand and use the different quantitative and qualitative methods to reason analytically, evaluate results and predict economic and financial parameters.

Be able to use English in a professional environment.

Be able to use ICTs in the field of study.

Be able to work in a team.

Demonstrate capacity for analysis and synthesis.

Demonstrate oral and written communication skills in the native language.

Have critical and self-critical capacity.

Have initiative and entrepreneurial spirit.

Have organisation and planning skills.

Manage time effectively.

Show creativity.

Show leadership and skills for mobilising the capacities of others.

Show motivation for quality.

DESCRIPTION OF CONTENTS

1. Introduction to Optimization

Introduction: the problem and its parts. Basic concepts: feasible solution, classes of optima 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 K-T 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 analysis and postoptimization

Introduction. Sensitivity and post-optimization objective function coefficients and right hand sides. Introducing new variables. Modeling, computer resolution and interpretation 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 addressed issues related to modeling, computer resolution and interpretation, applying all relevant theory, the results obtained. Professor resolve some previously proposed models and performing 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 exercises and / or equipment which shall be modeled, solved with a computer and they 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.

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 assesssment, 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.

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