COURSE DATA

DATA SUBJECT

Code: 36497
Name: Mathematical Modelling for Management
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2025-26

STUDY (S)

Degree	Center	Acad. year	Period
1332 - Degree in Business Intelligence and Analytics	Facultat d'Economia	1	First quarter

SUBJECT-MATTER

Degree	Subject-matter	Character
1332 - Degree in Business Intelligence and Analytics	Matemáticas	BASIC

COORDINATION

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SUMMARY

"Mathematical Models for management" is a one semester foundation course in basic mathematics for business placed in the first
term of the first year of the Degree in Business Intelligence and Analytics and has a total of 6 credits.

This course is concerned with the essential mathematics for the quantitative description, analysis and comprehension of economic environment and for making business decisions. Moreover, it provides the basic concepts, techniques and mathematical tools for dealing with the other courses of this Degree.

Contents include matrix algebra, functions of one and several variables: tendency, continuity and marginal analysis, and an introduction to integral calculus.

PREVIOUS KNOWLEDGE

RELATIONSHIP TO OTHER SUBJECTS OF THE SAME DEGREE

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

OTHER REQUIREMENTS

Prior knowledge assumed is that corresponding to first and second year in high school in the field of humanities and social sciences.

COMPETENCES / LEARNING OUTCOMES

1332 - Degree in Business Intelligence and Analytics

Acquire basic training that can be used to learn new methods and technologies and to adapt to new situations in academic and professional areas.

Apply methods and techniques of analysis, synthesis and graphical representation by means of software tools.

Be able to access and manage information in different formats for subsequent analysis in order to obtain knowledge through data.

Be able to analyse and search for information from diverse 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 learn autonomously.

Be able to make autonomous decisions in digital environments characterised by the abundance and dynamism of data.

Be able to produce models, calculations and reports, and to plan tasks in the specific field of business intelligence and analytics.

Be able to solve problems and to communicate and spread knowledge, skills and abilities, taking account of the ethical, egalitarian and professional responsibility of the activity of business intelligence and analytics.

Be able to use ICT, both in academia and in professional practice.

Be able to work in a team demonstrating commitment to quality, ethics, equality and social responsibility.

Demonstrate skills for analysis and synthesis.

Know and know how to properly use the appropriate quantitative and qualitative methods to reason analytically, evaluate results and predict economic and financial magnitudes.

Students must be able to apply their knowledge to their work or vocation in a professional manner and have acquired the competences required for the preparation and defence of arguments and for problem solving in their field of study.

Students must be able to communicate information, ideas, problems and solutions to both expert and lay

audiences.

Students must have acquired knowledge and understanding in a specific field of study, on the basis of general secondary education and at a level that includes mainly knowledge drawn from advanced textbooks, but also some cutting-edge knowledge in their field of study.

Students must have developed the learning skills needed to undertake further study with a high degree of autonomy.

Students must have the ability to gather and interpret relevant data (usually in their field of study) to make judgements that take relevant social, scientific or ethical issues into consideration.

DESCRIPTION OF CONTENTS

1. Algebra
Basic matrix calculus: systems of linear and nonlinear equations; matrices, determinants, and inverse matrix computation; matrix operations and solving large-scale systems using computational tools.
Advanced matrix calculus: eigenvalues and eigenvectors; matrix diagonalization; matrix factorization. Application to machine learning algorithms in the field of Business Intelligence and Analytics.

2. Concept of a Function
Concept of single-variable and multivariable functions. Contour lines. Examples of multivariable functions used in Economics: production, demand, and utility functions. Examples of functions used in machine learning: loss/error functions and learning functions.

3. Differentiability of Functions
Calculation of partial derivatives of multivariable functions. Directions of increase/decrease of a function. Higher-order derivatives of multivariable functions. Computation of the Hessian matrix. Application to machine learning algorithms in the field of Business Intelligence and Analytics. Implementation through a software program.

4. Introduction to Integral Calculus
Basic techniques for computing antiderivatives. Riemann integral and Barrow¿s rule. Basic applications of Riemann integration in probability and statistics.

WORKLOAD

PRESENCIAL ACTIVITIES

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

NON PRESENCIAL ACTIVITIES

Activity	Hours
Independent study and work	30,00

Preparation of lessons	30,00
Preparation for assessment activities	30,00
Resolution of case studies	0,00
Total hours	**90,00**

TEACHING METHODOLOGY

The learning methodology consists of lectures and practice sessions, where the teacher encourages students in the use of mathematical and symbolic language and logic and systematic thinking and he/she promote the individual and team private study learning.
In the lectures the lecturer explains the major topics, illustrate and clarifies definitions and theorems using completely worked out examples, and assists students in their self-study learning and use of the bibliography. The lecturer's explanations will be combined with the students' participation in class through small questions and exercises designed for the discussion of frequents doubts. At the end of the class, the lecturer will give guidelines and homework to prepare next class at home. The aim is that the student develops his/her capacity for self-study and self-learning and for expressing formally using mathematical and symbolic language.

In the practice sessions the lecturer shows the main economic and business applications of the topics developed in the lectures and encourages students in the definition, solution and formal discussion of complex problems. The lecturer will solve worked out problems and he/she will propose de preparation of new ones for the next classes. Thus, each student will be able to formulate problems and propose and justify his/her method of resolution.

In some practical classes the computer will be used to learn to solve some of the problems that arise in class through some computer program.

The study and/or posterior development of lectures and practice sessions will generate written assignments and class and homework tasks which can will be taken into consideration in the continuous assessment of student.

EVALUATION

The evaluation of the course is based on a system consisting of the following parts:
1. Written exam in the day officially announced. In this exam, the estudent will be evaluated on the specific competencies over the course content and application (maximum mark 7 points).
2. Continuous evaluation of the student which will assess the achievement of general competencies and the degree of participation of the student in the process of teaching and learning by doing exercises (maximum mark 3 points). Part of the continuous evaluation may consist of solving exercises by computer. All these activities can be retaken.
To pass the course the written exam must be overcome. The final mark is the sum of the written exam plus the continuous evaluation mark. Logically, to pass the course you must obtain a final mark greater than or equal to five (5). If the written exam is not overcome , the maximum final grade will be of 4.5 points.

REFERENCES

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