

## Mathematics Applied to Economic Analysis

UGRA\_013003

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Departments	Data, Analytics, Technology and Artificial Intelligence (DATA), Dept. of Operations, Innovation & Data Sciences
Teaching Languages	English
ECTS	7
Teacher responsible	Jordi Montserrat Adell - <a href="mailto:jordi.montserrat4@esade.edu">jordi.montserrat4@esade.edu</a>

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<b>Course Goals</b>	After completing this course, students should be able to:
	<ul style="list-style-type: none"><li>- Recognise and use mathematical language fluently in specific situations.</li><li>- Relate and use the concepts and theoretical models of basic matrix algebra and one and two-variable calculus, as well as differential equations, to apply them over the course of their academic and professional career.</li><li>- Use mathematical reasoning and demonstrate basic propositions.</li><li>- Demonstrate rigorous deductive processes.</li></ul>

<b>Previous knowledge</b>	Basic knowledge of functions of one variable and solving linear equations (simultaneous or not).
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<b>Prerequisites</b>	Ability to work in English.
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<b>Recomended courses</b>	It is recommended to take the course Introduction to Mathematics Applied to Economic Analysis.
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<b>Teaching methodology</b>	The course combines lectures and participatory sessions:
	<ul style="list-style-type: none"><li>• Lectures: In these classes, faculty will combine theoretical explanations with examples. Lecture classes might include tests. Students' marks on these will be taken into account to determine their overall marks for the subject.</li></ul>
	<ul style="list-style-type: none"><li>• Participatory sessions: In these classes, students will be asked to complete exercises by themselves. Some of these exercises will focus on preliminary concepts, while others will be dedicated to resolve more advanced problems, both related to the previous lecture class. These exercises might be handed in at the end of class.</li></ul>

## Description

### Course contribution to program

Mathematics is an essential tool for quantitative information analysis, the creation and interpretation of models to explain the economic and financial reality of the business environment and for the development of structured reasoning processes.

### Short description

This course introduces the basic mathematical methods used in economic analysis. Students will learn essential topics such as linear algebra, calculus, optimization, focusing on their practical use in economics. The course will cover functions, derivatives, integrals, differential equations, and matrix operations, showing how these concepts help solve real economic problems. By the end of the course, students will be able to use these mathematical tools to understand and analyze various economic issues effectively.

## Program Learning Objectives

### GEL23-Bachelor of Global Governance, Economics and Legal Order

- Critical and Analytical Thinking
- Apply relevant techniques and tools to analyze and evaluate economic and financial information.
- Apply relevant data analysis techniques and tools in the context of social science.

## Bibliography

Knud Sydsæter, Peter Hammond, Arne Strøm, Andrés Carvajal, Essential Mathematics for Economic Analysis, Pearson, 9781292359281 (Book)

Malcolm Pemberton, Nicholas Rau, Mathematics for Economists: An Introductory Textbook, Manchester University Press, 978-1-7849-9148-7 (Book)

Laurence D. Hoffmann, Gerald L. Bradley, David Sobecki, Michael Price, Applied Calculus for Business, Economics, and the Social and Life Sciences, McGraw Hill, 9780073532370 (Book)

## Activities

Quizzes/tests  
Regular tests to assess students' performance.

## Content

#	Topic
1	Matrices: definition, types of matrices and operations; linear combination and dependency; eigenvalues and eigenvectors; diagonalization
2	Study of functions of one variable: introduction to real functions; limits of functions and continuity; derivative of a function and its applications; Taylor polynomial; optimisation of functions; single integrals
3	Study of functions of two variables: partial and directional derivatives; extrema of a two-variable function; constrained optimisation; double integrals
4	Differential equations: definition of a differential equation; resolution of separable and linear differential equations

## Assessment

Tool	Assessment tool	Category	Weight %
Other	Class participation	Retake and ordinary round	10.00%
Quizzes/tests	Tests	Retake and ordinary round	25.00%
Written and/or oral exams	Exam Units 1&2	Ordinary round	35.00%
Written and/or oral exams	Exam Units 3&4	Ordinary round	30.00%
Written and/or oral exams	Retake exam	Retake	65.00%

## PROGRAMS

GBL24-Double Degree in Business Administration and Global Governance, Economics and Legal Order (Undergraduates: Business)

GBL24 Year 1 (Optative)

GBL25-Double Degree in Business Administration and Global Governance, Economics and Legal Order (Undergraduates: Business)

GBL25 Year 1 (Optative)

GDL20-Double Degree in Law and Global Governance, Economics and Legal Order (Undergraduates: Law)

GDL20 Year 2 (Optative)

GDL23-Double Degree in Law and Global Governance, Economics and Legal Order (Undergraduates: Law)

GDL23 Year 2 (Optative)

GEL19-Bachelor of Global Governance, Economics and Legal Order (Undergraduates: Law)

GEL19 Year 2 (Optative)

GEL23-Bachelor of Global Governance, Economics and Legal Order (Undergraduates: Law)

GEL23 Year 2 (Optative)

GEL25-Bachelor of Global Governance, Economics and Legal Order (Undergraduates: Law)

GEL25 Year 2 (Optative)