



TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Calculus
Subject code	E000006065
Main program	Grado en Análisis de Negocios/Business Analytics
Involved programs	Grado en Análisis de Negocios/Business Analytics y Grado en Relaciones Internacionales [First year] Grado en Análisis de Negocios/Business Analytics y Grado en Derecho [First year] Grado en Administración y Dirección de Empresas y Grado en Análisis de Negocios/Business Analytics [First year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Compulsory
Department	Departamento de Métodos Cuantitativos
Coordinator	José Portela González

Teacher Information	
Teacher	
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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject
Contribution to the professional profile of the degree
<p>This course aims to develop in the professional profile of the graduate in Business Analytics the skills of modeling business and economics problems in mathematical terms of differential and integral calculus, analysis and synthesis of information received in mathematical language, business problem solving, and optimal and timely decision making by application of the mathematical techniques and tools developed in the subject. In addition, the knowledge and skills acquired by the end of the semester, students will lay the foundations for learning other subjects that they will study in subsequent courses</p>
Prerequisites



Nothing

Competencies - Objectives

Competences

GENERALES

CG02	Capacidad de análisis de datos masivos procedentes de diversas fuentes: texto, audio, numérica e imagen	
	RA1	Ser capaz de analizar y sintetizar la información recibida en lenguaje matemático
CG03	Resolución de problemas y toma de decisiones en un entorno de datos masivos tanto cuantitativos como cualitativos	
	RA1	Conocer las herramientas matemáticas básicas que les capacite para plantear y resolver los problemas reales planteados en el mundo de la empresa
CG09	Compromiso ético en la sociedad de la información	
	RA1	Persigue la excelencia en las actuaciones profesionales
CG11	Capacidad para aprender y trabajar autónomamente en la sociedad de la información	
	RA1	Ser capaz para aplicar los conocimientos obtenidos en contextos nuevos
	RA2	Ser capaz para aprender nuevos métodos y teorías de forma autónoma en su vida profesional

ESPECÍFICAS

CE17	Adquirir la capacidad para la resolución de los problemas planteados en el entorno empresarial utilizando las herramientas matemáticas	
	RA2	Modelizar en términos del cálculo diferencial e integral situaciones dependientes de varias variables
CE18	Conocer y utilizar las técnicas matemáticas de optimización y decisión para el tratamiento de datos	
	RA3	Analizar e interpretar las soluciones obtenidas

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Topic 2: FUNCTIONS OF SEVERAL VARIABLES

- 1. Definition of functions of several variables. Scalar function and vector function.
- 2. Mathematical domain, economic subdomain and image.
- 3. Graph of a scalar function and level curves.
- 4. Limits and continuity.

- 5. Directional derivatives. Partial derivatives
- 6. Gradient vector. Properties.
- 7. Applications in economics: marginal magnitudes in economics, marginal ratio of substitution.
- 8. Concept of differential.
- 9. Derivatives of a higher order. Hessian matrix
- 10. Second differential.
- 11. Taylor polynomial. Taylor's theorem

Topic 3: COMPOUND AND HOMOGENEOUS FUNCTIONS

- 1. Partial derivatives of compound functions. Chain rule. Dependency trees.
- 2. Homogeneous functions. Euler's theorem. Returns to scale.

Topic 4 and 5: OPTIMIZATION

- 1. Program concepts and their types. Modeling.
- 2. Concept of optimum and types of optimum.
- 3. Elements of topology and Weierstrass theorem.
- 4. Graphic resolution of an optimization program.
- 5. Convex sets. Definition and characterization of concave and convex functions.
- 6. Optimization without restrictions (free).
- 7. Optimization with equality constraints. Substitution method, Lagrange multipliers method.
- 8. Interpretation of the Lagrange multipliers.
- 9. Optimization with conditions of inequality. Kuhn-Tucker conditions.

Topic 1: THE INTEGRAL

- 1. Concept of primitive function.
- 2. Riemann's Integral Concept.
- 3. Properties of the Riemann Integral.
- 4. Integral function.

TEACHING METHODOLOGY

General methodological aspects of the subject

In-class Methodology: Activities

Expository lesson: The teacher will explain the fundamental concepts of each topic, focusing on the most important ones and then solving a series of standard problems, with which the student will learn to identify the essential elements of the approach and will begin acquiring the necessary skills.

Problem-solving in class: These sessions will explain, correct, and analyze problems of each topic analogous to those solved in the lectures and also others of greater complexity, previously proposed by the teacher and worked on by the student.

Computer Practices: Practices with a computer will be carried out. In them, the students will exercise the concepts and techniques studied, solving practical problems using the programming language Matlab.

Tutorials: They will be carried out in groups and individually, to solve the different doubts that are raised to the students, after having studied the different topics and worked on the different problems.



Non-Presential Methodology: Activities

Autonomous work on theoretical content by the student. Individual and personal study by part of the student of the concepts exposed in the expository lessons.

Autonomous work on practical content by the student. Solving practical problems out of class time by the student.

Carrying out collaborative work by the student.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS	
Lecciones de Carácter expositivo	Seminarios y talleres
54.00	4.00
NON-PRESENTIAL HOURS	
Estudios individual y/o en grupo, y lectura organizada	
92.00	
ECTS CREDITS: 6,0 (150,00 hours)	

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Final exam	<ul style="list-style-type: none"> Understanding of concepts. Application of concepts, techniques and troubleshooting procedures practical. Analysis and interpretation of the results obtained in problem-solving. Presentation and written communication. <p>Observation: If the grade obtained in the final exam for the subject is less than 4.25 points, the student's grade will be the grade obtained in the said exam.</p>	70 %
Midterm exams	4 tests will be carried out throughout the course	30

Ratings

The student's grade in the extraordinary call for the subject will be considered the best of the following two options:

1. Use the same criteria as in the ordinary call..
2. Consider only 100% of the grade for the extraordinary session exam.



COMILLAS

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Syllabus
2022 - 2023

Observation: If the grade obtained in the final exam for the subject is less than 4.25 points, the student's grade will be the grade obtained in the said exam.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

- Sydsaeter, K., Hammond, P. J., Matemáticas para el análisis económico. Prentice Hall, 1999
- Anthony, M., Biggs, N., Mathematics for economics and finance. Methods and modelling. Cambridge University Press, 1996

Complementary Bibliography

- García, A., López, A., Romero, S., Rodríguez, G., Villa, A. de la. Calculo II: Teoría y problemas de funciones de varias variables (2ª edición). CLAG, 2006.
- Martínez Estudillo, F.J., Introducción a las matemáticas para la economía. Desclée De Brouwer, S.A., 2005

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