



TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Business Mathematics II
Subject code	E000011445
Main program	Bachelor's Degree in Business Administration and Management (E-2)
Involved programs	Grado en Administración y Dirección de Empresas (E-2) [First year] Grado en Administración y Dirección de Empresas y Grado en Derecho [First year] Grado en Administración y Dirección de Empresas con Mención en Internacional (E-4) [First year] Grado en Administración y Dirección de Empresas y Grado en Relaciones Internacionales [First year] Grado en Administración y Dirección de Empresas (E-2) - Bilingüe en inglés [First year] Grado en Psicología y Grado en Administración y Dirección de Empresas [First year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Compulsory
Department	Departamento de Métodos Cuantitativos
Coordinator	GLORIA MARTIN ANTÓN

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject
Contribution to the professional profile of the degree
A student that obtains the Degree in Business Administration needs to develop the ability for abstract thoughts in the business world. A quantitative modeling skill and the use of a formal language, that are essential to develop these skills, are largely provided
Prerequisites
None. It could be advisable for students to take the Mathematics Course offered at the Pre-University Campus

Competencies - Objectives	
Competences	
GENERALES	
CG1	Adquirir una base de conocimientos sólida y relevante sobre la disciplina científica y empresarial
	RA1 Capacidad de expresarse en lenguaje matemático
	RA2 Capacidad de utilización de las matemáticas en otras materias del grado
CG14	Capacidad para aprender y trabajar autónomamente.
	RA1 Desarrolla habilidades necesarias para el estudio e investigación independiente
	RA2 Encuentra por sí mismo aplicaciones y extensiones de los conceptos y metodologías estudiadas
CG2	Capacidad de gestionar información y datos provenientes de fuentes diversas para hacer un análisis crítico y un correcto diagnóstico de la realidad empresarial.
	RA1 Capacidad para la formulación en lenguaje matemático de los problemas que surgen en la gestión empresarial y de la resolución de los mismos.



ESPECÍFICAS		
CE8	Conocimiento de técnicas matemáticas que permiten modelizar y resolver problemas en el ámbito económico-empresarial	
	RA1	Ante un enunciado de un problema empresarial es capaz de utilizar los instrumentos matemáticos que mejor representan el problema.
	RA2	Apoyándose en el análisis gráfico, verbal y los datos cuantitativos y cualitativos es capaz de integrarlos en modelos gradualmente más complejos.
	RA3	Es capaz de aplicar correctamente a los problemas empresariales el álgebra lineal, análisis funcional, cálculo integral y búsqueda de óptimos.

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks
BLOQUE I: FUNCTIONS OF SEVERAL VARIABLES I
TOPIC 1: FUNCTIONS OF SEVERAL VARIABLES I
1.1 Definition of function of several variables. Domain and Image.
1.2 Graphic representation. Level curves.
1.3 Limits and continuity
1.4 Directional derivatives. Partial derivatives.
1.5 Gradient. Properties.
1.6 Higher order derivatives. Hessian matrix.
1.8 Taylor polynomial. Taylor's theorem
TOPIC 2: FUNCTIONS OF SEVERAL VARIABLES II
2.1 Several variable function composition. Chain rule
2.2 Homogeneous functions. Euler's theorem of homogeneous functions.
BLOQUE II: OPTIMIZATION THEORY
TOPIC 3:INTRODUCTION TO OPTIMIZACIÓN
3.1 Optimization programs and their types. Modeling.
3.2 Optimal points and types.
3.3 Graphical resolution of an optimization program.
3.4 Elements of Topology.



3.5 Theorem of Weiestrass.

TOPIC 4: CONVEXITY ANALYSIS

4.1 Convex sets and properties.

4.2 Concave and convex functions. Properties.

4.3 Characterization of convexity for class C^1 functions.

4.4 Characterization of convexity for class C^2 functions.

4.5 Convex programs. Local-Global Theorem.

TOPIC 5: FREE OPTIMIZATION

5.1 Necessary condition

5.2 Sufficient condition

5.3 Sufficiency of the necessary condition

TOPIC 6: RESTRICTED OPTIMIZATION

6.1 Types of restricted optimization programs.

6.2 Optimization with equality restrictions.

6.3 Implicit Functions. Existence Theorem.

6.4 Lagrange multipliers method.

6.5 Sufficient condition of local optimum.

6.6 Lagrange multiplier interpretation.

6.7 Optimization with inequality constraints, Khun-Tucker conditions

TEACHING METHODOLOGY

General methodological aspects of the subject

In-class Methodology: Activities

Expository lectures

General content presentation sessions

Public presentations of topics and works

Exercises and problem resolution

CG1, CG2, CG14, CE8

Non-Presential Methodology: Activities



Tutorials sessions	CG1, CG2, CG14, CE8
Learning in groups of students	

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS		
Lecciones de carácter expositivo	Ejercicios y resolución de casos y de problemas	Sesiones tutoriales
34.00	20.00	16.00
NON-PRESENTIAL HOURS		
Sesiones tutoriales	Estudio individual y/o en grupo y lectura organizada	
12.00	78.00	
ECTS CREDITS: 6,0 (160,00 hours)		

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
WRITTEN EXAM: with theory and problem	<ul style="list-style-type: none"> Same Criteria for all students of the course. In order to carry out the weighted average between the final grade and the tests, it is necessary to obtain, at least, 4 over 10 in the Final Exam. 	70
CONTINUOUS EVALUATION: WRITTEN EXAMS <ul style="list-style-type: none"> 1st exam on partial derivatives 2nd exam on the topics 1 and 2 3rd exam on topic 3 4th exam on topics 4 and 5 PRESENTIAL ACTIVITIES	A 25% will be obtained doing the average made with: <ul style="list-style-type: none"> The 1st exam The two best marks of the other exams A positive valuation will be weighted on presential activities mentioned in the qualification part	30 %

Ratings

FINAL QUALIFICATIONS

FINAL EXAM: 70% WRITTEN

EXAMS: 25% of the average obtained with the mark of the first exam and the best two marks of the remaining three exams

- Exam 1: on partial derivatives (this test always counts)



- Exam 2: on topics 1 and 2 E
- Exam 3: on topic 3
- Exam 4: on topics 4 and 5

PRESENIAL ACTIVITIES: a positive valuation 5% over of the grade is given by the teacher for the completion of the following activities:

- Class participation.
- Attendance to individual and group tutorials
- Expositions in the blackboard
- Proposed voluntary works

FINAL CONSIDERATIONS:

- In order to carry out the weighted average between the final grade and the tests, it is necessary to obtain, at least, 4 over 10 in the Final Exam.
- *If a student cannot take a exam at this moment, it will not be repeated

EXTRAORDINARY

- The final califications will be the best of the these two options: 70% exam + 30% the rest or 100% the exam.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

Giménez Abad, M^a J., Martín Antón, G. y Serrano Rey, A.: Matemáticas para ADE. Teoría y ejercicios. Editorial Pearson. Madrid 2020

Complementary Bibliography

Martínez Estudillo, Francisco J.: "Introducción a las Matemáticas para la Economía". Editorial DDB. 2005

Sydsaeter, K. y Hammond, P.J.: "Matemáticas para el análisis económico". Editorial Prentice Hall. 1999

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