TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Financial Mathematics
Subject code	E000005830
Mainprogram	[Bachelor's Degree in Business Administration and Management](#)
Involved programs	Grado en Administración y Dirección de Empresas (E-2) [Segundo Curso] Grado en Administración y Dirección de Empresas y Grado en Derecho (E-3) [Segundo Curso] Grado en Administración y Dirección de Empresas y Grado en Derecho (E-3 16) [Segundo Curso] Grado en Administración y Dirección de Empresas con Mención en Internacional (E-4) [Segundo Curso] Grado en Administración y Dirección de Empresas y Grado en Relaciones Internacionales (E-6) [Segundo Curso] Grado en Administración y Dirección de Empresas (E-2) - Bilingüe en inglés [Segundo Curso] Grado en Ingeniería en Tecnologías de Telecomunicación y Grado en ADE [Tercer Curso] Grado en Ingeniería en Tecnologías Industriales y Grado en Administración y Dirección de Empresas [Tercer Curso] Grado en Ingeniería en Tecnologías de Telecomunicación y Grado en ADE [Tercer Curso]
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos
Coordinator	Susana Carabias López

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

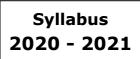### Contribution to the professional profile of the degree

The subject is designed to provide students with the knowledge and the resources that are needed to analyze and compare financial operations that are held in an environment characterized by certainty, as well as the foundations to solve problems associated with many kinds of financial transactions.

Prerequisites

Mathematics at high school level.

Competencies - Objectives

Competences

GENERALES

CG01		Capacidad de análisis y síntesis
	RA1	Capacidad para expresarse en lenguaje matemático
	RA3	Identifica estructuras comunes en situaciones reales diferentes
CG02		Resolución de problemas y toma de decisiones
	RA1	Capacidad para la formulación en lenguaje matemático de los problemas que surgen en la gestión empresarial y de la resolución de los mismos
CG04		Capacidad de gestionar información proveniente de fuentes diversas
	RA1	Capacidad de búsqueda y selección de bibliografía adecuada y otras fuentes para documentarse sobre un contenido concreto
CG14		Capacidad para aprender y trabajar autónomamente
	RA2	Desarrolla habilidades necesarias para el estudio e investigación independiente

ESPECÍFICAS

CE08		Conocimiento de técnicas matemáticas que permiten modelizar y resolver problemas en el ámbito económico-empresarial
	RA1	Aplica la abstracción la simplificación para modelar en términos matemáticos el problema al que se enfrenta

	RA2	Conoce los instrumentos matemáticos necesarios para la modelización
	RA9	Conoce las variables y funciones más relevantes en la valoración de mercados de renta fija
CE09	Comprensión y correcta aplicación de los modelos matemáticos dinámicos y de valoración financiera	
	RA1	Conoce y sabe aplicar los conceptos de ley financiera y equivalencia financiera
	RA2	Es capaz de interpretar la información instituciones de operaciones financieras e identificar su estructura

THEMATIC BLOCKS AND CONTENTS

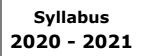| Contents - Thematic Blocks |
|---|
| **BLOCK 1: FUNDAMENTAL ELEMENTS OF FINANCIAL MATHEMATICS** |
| Topic 1: FINANCIAL CAPITALS AND FINANCIAL OPERATIONS |
| **1.1** Financial capital: definition and unit of measure

1.2 Financial operations: definition

1.3 Financial operations: classification |
| Topic 2: FINANCIAL LAWS |
| **2.1** Financial law as a criteria to project financial capitals

2.2 Commonly used laws of accumulation

2.3 Commonly used laws of discount |
| Topic 3: FINANCIAL EQUILIBRIUM |
| **3.1** The equation of financial equivalence

3.2 The financial equilibrium of a financial operation

3.3 Income and effective rates. The rules of the Spanish Central Bank: TAE

3.4 Outstanding balance. Definition and calculation methods |
| **BLOCK 2: FINANCIAL OPERATIONS IN THE LONG RUN** |
| Topic 4: VALUATION OF ANNUITIES |
| **4.1** Annuities: definition and classification |

4.2 The value of constant annuities

4.3 The value of variable annuities

4.4 Application to financial decisions. NPV and IRR

Topic 5: PRIVATE LOANS

5.1 Concept and general overview

5.2 Classical amortization methods

5.3 Mortgage loans

BLOCK 3: INTRODUCTION TO MARKET VALUATION

Topic 6: OPERATIONS WITHIN "FIXED INCOME" MARKETS

6.1 Public promissory notes (Treasury Bills)

6.2 Government bonds

6.3 The market value of a loan

6.4 The term structure of interest rates (TTIR)

TEACHING METHODOLOGY

General methodological aspects of the subject

In-class Methodology: Activities

Magistral class: The teacher will explain the subject's basic concepts as well as the relations between them, with emphasis on the fact that the same principles can be applied to study a wide range of financial operations. The material explained in each class will be based on the material taught in the previous ones; for this reason, to obtain the best results it is key to deeply assimilate previously learnt concepts. In addition, the student is recommended to bring to each class the material that corresponds to it.
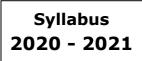
Practical class: In each session we will discuss the exercises that the student worked out at home and we wil present new probems to be solved in class. Quizzes will be administered as independent activities. The work may be submitted upon teacher's request at the end of a class. Students are expected to actively participate in the practical sessions with an adequate knowedge of the material, which will contribute to the student's overall score on the subject

Midterm exams: depending of the topic, midterm exams they will have different formats and be more or less comprehensive; they will be designed to assess the student's understanding of the subject

Non-Presential Methodology: Activities

Preparation for the magistral class: At the end of each class the students are supposed to figure out

what they have learned and supplement it with the provided material. The student who does not achieve an optimum performance in the master class will be expected to talk yto their teacher in order to identify the sources of their problem.

Preparation for the practical class: The student is expected to solve the exercises that the teacher will indicate before each practical class.

Preparation and analisis of midterm exams: At the end of each topic, the student is expected to review all the concepts that they have have learned and understand the relationships that exist between them and with the concepts learned in previous topics. When the student receives a graded test they should critically analyze their mistakes and talk to the professor in case the score does not correspond with their expectations.

Assignment I: once having made a group of three, the students are expected to select an actual loan and analyze it. They are expected to submit two reports, one at the beginning of the course and another at the end, by so reflecting their understanding progress.

Assignment II (non-mandatory): once having made a group of three, the students are expected to compare the presentation of a key concept of financial mathematics done in the basic bibliography with another source of their choice. Then, they are expected to produce a report based on this comparison.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS
NON-PRESENTIAL HOURS
ECTS CREDITS: 6,0 (0 hours)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Tests for all groups in each specialty	• To understands concepts • To properly apply these concepts to solve the problems that relate to financial operations	75
Continuous evaluation exams	• To understands concepts • To properly apply these concepts to solve the problems that relate to financial operations	10
	• To identify quality information • To identify the relevant information for a given problem • To correctly interpret the information provided by a	

Assignments	financial institution • To correctly apply the concepts related to specific loans • To learn how to quote and reference properly • To develop concepts and conclusions by using a language that is consistent with what is required	10
Active class participation	• To correctly perform the required work • To actively participate in class activity	5

Ratings

In what follows we briefly describe the rules of evaluation we will adopt for the subject of Financial Mathematics. In parenthesis we specify the weight that each activity/skill will receive in the student's overall course score that we will apply to students that are enrolled for the first time. Students with 'dispensa de escolaridad' or students who will take the final exam on 'tercera convocatoria' or higher will receive the highest between the final exam score and the score determined as for the students enrolled for the first time (the latter will ONLY be applied to the activities that the student will decide to undertake).

Final exam (65%-75%) We aim at establishing whether the student understand and is able to manage the basic concepts that will be explained in the subject, as well as whether he/she is able to apply them operatively to the analysis of the financial operations that will be discussed during the course.

The final exam will be the same (and will be offered on the same date and time) of the remaining students of the same 'especialidad'.

Continuous evaluation exams (10%-20%) During the class time and on the dates announced in class, we will administer four short midterm exams with problems and/or multiple choice questions.

The topics that will be covered in each exam will focus on those concepts that we expect the student to manage for a normal understanding of the subject. In no circumstance, were the student unable to take one or more midterm exam (and independently on the reason) the exam will be offered as a makeup or taken with a different professor.

If, subject to the teacher's unquestionable opinion, failing to take a midterm exam has a justifiable reason, the (zero) score earned in that exam will not be used to calculate the student's final score. Students are expected to not ask for exceptions to these rules.

Assignments (10%) By making groups of three people, students are expected to submit three extensive reports (the first report will be submitted again as a third revised assignment) focusing of the search and

the analysis of financial information, Please see details on the documents that are available in Moodle.

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Assignment 1	week 2	week 3
Assignment 2 **(non-mandatory)**	Between week 2 and 5	Between week 3 and 6
Assignment 3	week 12	week 13

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

TEXTBOOK

Bonilla Musoles, MA, Ivars Escortell, AN & Ismael Moya CL 2006, *Matemática de las operaciones financieras: teoría y práctica,* Thomson, Madrid.

Kellison, ST 2009, The theory of interest. McGraw-Hill, New York

WEB SITES

Banco de España: http://www.bde.es/

Tesoro Público: http://www.tesoro.es/

Complementary Bibliography

TEXTBOOKS:

Bonilla Musoles, MA & Ivars Escortell, MA 1994, *Matemáticas de las operaciones financieras : (teoría y práctica), AC,* Madrid.

Gil Peláez, LO, Baquero, MJ, Gil, MA & Maestro, ML 1991, *Matemática de las operaciones financieras: problemas resueltos,* AC, Madrid.
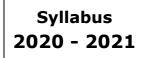
Pablo López, AN 2000, *Manual práctico de matemática comercial y financiera,* Centro de Estudios Ramón Areces, Madrid.

Pablo López, AN 2002, *Valoración financiera,* Centro de Estudios Ramón Areces, Madrid.

Pablo López, AN de 2003, *Matemática de las operaciones financieras I*, UNED, Madrid.

Vaaler, L.J.F., Harper, S.K. & Daniel, J.W. Mathematical Interest Theory (Third Edition), 2019, The

Mathematical Association of America