TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Financial Mathematics
Subject code	E900006931
Mainprogram	Grado en Análisis de Negocios/Business Analytics
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos

Teacher Information	
Teacher	
Name	Ignacio Blasco Paniego
EMail	iblasco@icade.comillas.edu
Teacher	
Name	María Elena González Antolín
Department	Departamento de Métodos Cuantitativos
EMail	mgantolin@icade.comillas.edu
Teacher	
Name	María Eugenia Fabra Florit
Department	Departamento de Métodos Cuantitativos
Office	Alberto Aguilera 23
EMail	mefabra@icade.comillas.edu
Phone	2239
Teacher	
Name	María Lourdes Fernández Rodríguez
Department	Departamento de Métodos Cuantitativos
Office	Alberto Aguilera 23 [Decanato (3ª planta)]
EMail	lourdesf@icade.comillas.edu
Phone	2283

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

CG02		Capacidad de análisis de datos masivos procedentes de diversas fuentes: texto, audio, numérica e imagen
	RA2	Ser capaz de obtener información de operaciones financieras y, a partir de ella, identificar su estructura.
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
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
	RA3	Conocer los modelos matemáticos que permiten analizar y comparar de operaciones financieras ciertas en tiempo discreto

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

Master class: The teacher will explain the subject's basic concepts as well as the relationships 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 corresponding material.

Practical class: In each session we will discuss the exercises that the student worked out at home and we will 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 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 master class: At the end of each class, students are supposed to self-assess what they have learned and supplement it with the provided material. Students not achieving an optimum performance in the master class will be expected to talk to their teacher in order to identify the sources of their problem.

Preparation for the practical class: Before each practical class, students are expected to solve the exercises previously pointed out by the teachere .

Preparation and analisis of midterm exams: At the end of each topic, the student is expected to review all the concepts that they 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: students, in groups of three people, will solve, using Excel, a practical case with financial operations.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS		
Lecciones de Carácter expositivo	Ejercicios y resolución de casos y de problemas	Seminarios y talleres
40.00	10.00	10.00
NON-PRESENTIAL HOURS		
Estudios individual y/o en grupo, y lectura organizada		
90.00		
ECTS CREDITS: 6,0 (150,00 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	65
Continuous evaluation exams	• To understands concepts • To properly apply these concepts to solve the problems that relate to financial operation	15
Assignments	• To identify quality information • To identify the relevant information for a given problem • To correctly interpret the information provided by a financial institution • To correctly apply the methodology related to specific cases	15
Active class participation	• To correctly perform the required work • To actively participate in class activity	5

Ratings

Evaluation rules are described in the following paragraphs. Each activity includes in parenthesis their weight in the student's overall course scores. These weights are applicable to students who enrolled for the first time (i.e. first call, en su primera convocatoria).

For students in their second or higher call (tercera convocatoria o superiores), or students with attendance waiver (dispensa de escolaridad), the course score will be the maximum between the final exam score and the score describe beforehand for students first-time enrolled (the latter will ONLY be applied to the activities that the student will decide to undertake).

Final exam (65%-75% Favorable compensation with continuous evaluation)

The purpose is to verify whether the student understands and manages the basic concepts that were explained during the classes, as well as to verify whether he/she is able to apply them to the analysis of the financial operations that were 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 degree study.

Continuous evaluation exams (10%-20% Favourable compensation with final exam)

During the class time and on the dates announced in class, there will be three short midterm exams. The topics that will be covered in each midterm exam will focus on the concepts that teacher expects to be managed by the students on a normal understanding of the subject.

Midterms exams will under no circumstances be repeated and students not taking the exam gets a zero score for that midterm exam. Subject to teacher's unquestionable opinion and provided a justifiable reason, the zero score earned in that exam might be excluded from the student's continuous evaluation score.

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	week 1 to 11	week 12
Assignment 3	week 12	week 13

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography
TEXTBOOK

TEXTBOOK

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

WEB SITES

Banco de España: http://www.bde.es/

Tesoro Público: http://www.tesoro.es/

Complementary Bibliography

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

Broverman, S.A., 2017 *Mathematics of Investment and Credit* , ACTEX

Francis, J. and Ruckman, C., 2018, *Interest Theory – Financial Mathematics and Deterministic Valuation*, ActuarialBrew

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