TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Matemáticas Financieras/ Financial Mathematics
Subject code	E000012783
Mainprogram	Grado en Análisis de Negocios / Business Analytics por la Universidad Pontificia Comillas
Involved programs	Grado en Análisis de Negocios/Bachelor in Business Analytics [First year]
Credits	3,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos

Teacher Information	
Teacher	
Name	Manuel González Igual
Department	Departamento de Métodos Cuantitativos
EMail	mgigual@comillas.edu
Teacher	
Name	María Elena González Antolín
Department	Departamento de Métodos Cuantitativos
EMail	mgantolin@icade.comillas.edu

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	
Learning outcomes	
CN6	Resultados del proceso de Formación y de Aprendizaje: CN6. Conoce las herramientas matemáticas necesarias que les capacite para plantear y resolver los problemas reales planteados derivados del entorno empresarial.

HA6	Resultados del proceso de Formación y de Aprendizaje: HA6. Utiliza las herramientas y técnicas matemáticas más adecuadas a cada problema, implementarlas, interpretar adecuadamente los resultados y sus limitaciones, y comunicarlos a un público no técnico.
RA1	MATEMATICAS FINANCIERAS. RA.1 Ser capaz de obtener información de operaciones financieras y, a partir de ella, identificar su estructura.
RA2	MATEMATICAS FINANCIERAS. RA.2 Conocer los modelos matemáticos que permiten analizar y comparar operaciones financieras ciertas

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks
BLOCK 1: FUNDAMENTAL ELEMENTS OF FINANCIAL MATHEMATICS
Topic 1. Introduction to financial mathematics
1.1 Time value of money 1.2 The concept of financial capital 1.3 Definition and classification of financial operations
Topic 2. Financial equivalence
2.1 Financial laws as criteria for financial equivalence 2.1. Financial equivalence between two financial capitals 2.3. Interest, discount and rates.
Topic 3. Compounded laws of accumulation and discount
3.1 Accumulation and discount with compound laws 3.2 Different rates for compound laws
Topic 4: Equivalence between provision and remuneration of a financial operation
4.1 Financial equilibrium of a financial operation 4.2 Income and effective rates.
BLOCK 2: FINANCIAL OPERATIONS IN THE LONG RUN
Topic 5. The value of annuities
5.1 Introduction to the value of annuities 5.2 The value of constant annuities

5.3 The value of variable annuities

5.4 Application to financial decisions. NPV and IRR

Topic 6. Loans

6.1. Global study of a loan

6.2 Outstanding debt or alive capital. Definition and calculation methods

6.3. Interest and repayment installments

6.4. Amortization schedule

6.5. Waiting periods

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. 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: midterm exams 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 instructor .

Preparation and analisis of midterm exams: To prepare midterm exams, 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: The students are expected to apply the concepts of annuities to financial valuation problems, using the spreadsheet Excel.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS

Lecciones de carácter expositivo	Ejercicios y resolución de casos y de problemas	Sesiones tutoriales	Pruebas de evaluación
14.00	14.00	6.00	2.00

NON-PRESENTIAL HOURS

Ejercicios y resolución de casos y de problemas	Estudio y lectura organizada	Trabajos monográficos y de investigación, individuales o colectivos
20.00	15.00	6.00

ECTS CREDITS: 3,0 (77,00 hours)

EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
Final exam	• To understand concepts • To properly apply these concepts to solve the problems that relate to financial operations	70
Midterm exams	• To understands concepts • To properly apply these concepts to solve the problems that relate to financial operations	15
Assignments	• To identify the relevant information for a given problem • To correctly apply the concepts related to specific problem • To develop concepts and conclusions by using a language that is consistent with what is required • To properly use the spreadsheet Excel to apply theoretical concepts	10
Active involvement/Class participation	• To correctly perform the required work • To actively participate in class activity • Constant work will be highly valued	5

Ratings

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

In the event that the exam grade exceeds that of the class tests, the weight of the final exam will rise to 75% and that of midterm will drop to 10%.

 Any action of the student aimed at increasing his qualification in a fraudulent way will imply that the corresponding activity has a grade of zero, in addition to the disciplinary consequences that may entail.

Any document or source of information from which an idea is obtained for the preparation of a work must be correctly cited, so that it is not interpreted as a fraudulent action. Following APA's directions, personal communications, whether with humans or machines, that cannot be retrieved or reproduced by another will not be included in the reference list, but will be cited only in the text, with the appropriate format. For example: (ChatGPT, personal communication, December 12, 2022).

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Assignment: apply the concepts of annuities to financial valuation problems, using the spreadsheet Excel.	Weeks 10 and 11	Week 12

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

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