

Academic Year: ( 2022 / 2023 )

Review date: 31/05/2022 18:54:27

Department assigned to the subject: Mathematics Department

Coordinating teacher: BERNAL MARTINEZ, FRANCISCO MANUEL

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear Algebra (Year 1 - Semester 1)  
 Differential Calculus (Year 1 - Semester 1)  
 Programming (Year 1 - Semester 1)  
 Integral Calculus (Year 1 - Semester 2)  
 Numerical Methods (Year 2 - Semester 1)  
 Probability (Year 2 - Semester 2)  
 Ordinary differential equations (Year 3 - Semester 1)

## DESCRIPTION OF CONTENTS: PROGRAMME

1. Stochastic integrals
2. Itô's calculus
3. Simulation of stochastic processes
4. Black-Scholes formula and risk neutral valuation
5. Numerical solution of stochastic differential equations
6. Unconstrained nonlinear optimization
7. Constrained nonlinear optimization

## LEARNING ACTIVITIES AND METHODOLOGY

AF1.THEORETICAL-PRACTICAL CLASSES. Knowledge and concepts students must acquire. Student receive course notes and will have basic reference texts to facilitate following the classes and carrying out follow up work. Students partake in exercises to resolve practical problems and participate in workshops and an evaluation tests, all geared towards acquiring the necessary capabilities. Subjects with 6 ECTS are 44 hours as a general rule/ 100% classroom instruction

AF2.TUTORING SESSIONS. Individualized attendance (individual tutoring) or in-group (group tutoring) for students with a teacher. Subjects with 6 credits have 4 hours of tutoring/ 100% on- site attendance.

AF3.STUDENT INDIVIDUAL WORK OR GROUP WORK. Subjects with 6 credits have 98 hours/0% on-site.

AF8.WORKSHOPS AND LABORATORY SESSIONS. Subjects with 3 credits have 4 hours with 100% on-site instruction. Subjects with 6 credits have 8 hours/100% on-site instruction.

MD1.THEORY CLASS. Classroom presentations by the teacher with IT and audiovisual support in which the subject's main concepts are developed, while providing material and bibliography to complement student learning.

MD2.PRACTICAL CLASS. Resolution of practical cases and problem, posed by the teacher, and carried out individually or in a group.

MD3.TUTORING SESSIONS. Individualized attendance (individual tutoring sessions) or in-group (group tutoring sessions) for students with teacher as tutor. Subjects with 6 credits have 4 hours of tutoring/100% on-site.

MD6.LABORATORY PRACTICAL SESSIONS. Applied/experimental learning/teaching in workshops and laboratories under the tutor's supervision.

## ASSESSMENT SYSTEM

**% end-of-term-examination/test:** 50

**% of continuous assessment (assignments, laboratory, practicals...):** 50

SE1.FINAL EXAM. Global assessment of knowledge, skills and capacities acquired throughout the course. The percentage of the evaluation varies for each subject between 60% and 0%.

SE2.CONTINUOUS EVALUATION. Assesses papers, projects, class presentations, debates, exercises, internships and workshops throughout the course. The percentage of the evaluation varies for each subject between 40% and 100% of the final grade.

#### BASIC BIBLIOGRAPHY

- Lawrence C. Evans An Introduction to Stochastic Differential Equations, AMS American Mathematical Society, 2013
- Peter E. Kloeden, Eckhard Platen Numerical Solution of Stochastic Differential Equations, Springer-Verlag, 1992