Front-Office Algorithms

Academic Year: (2023 / 2024) **Review date: 30/03/2023 15:13:02**

Department assigned to the subject: Computer Science and Engineering Department

Coordinating teacher: FERNANDEZ ARREGUI, SUSANA

Type: Electives ECTS Credits : 3.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Algorithms and Data Structures

OBJECTIVES

- Application of theoretical knowledge to practical and new problems in a broader context related with the corresponding study area.
- The students need the ability to learn how to continue learning in an autonomous manner.
- Ability to apply the different methods and techniques of the Computer Science Ã¡rea in the financial markets.
- Capaticty of design, develop and implement a process to develop software for financial markets.
- Ability to solve new problems in a broader and multidisciplinary context applying the theoretical concepts.
- Multidisciplinary Team work.
- Development of financial software, from the analysis phase to its implementation and integration with other systems.
- Implementation of algorithms and techniques of the financial markets following the corresponding standards and procedures.

Results of the learning process:

- Knowledge of the main programming languages used in the development of financial software.
- Ability to develop software in the financial software.
- Knowledge about the high performance computing.
- Knowledge about the different algorithms used in the financial market: front-office and back-office.
- Capacity to develop financial algorithms in all their layers.
- Knowledge of the main Open sources proposals available.
- Knowledge about the validation and verification of the financial software.
- Knowledge about the main management tools.
- To understand the Project Management in financial markets.

DESCRIPTION OF CONTENTS: PROGRAMME

Front-Office Algorithms:

1. Introduction to the financial calculus
2. Interest rates product valuation
3. Interest rates curve construction
4. Option valuation algorithms
5. Montecarlo simulation method
6. Sensitivities computation
7. Valuation adjustments on derivatives
8. Development of practices and projects

LEARNING ACTIVITIES AND METHODOLOGY

Learning activities

- Theory classes: Basic theoretical knowledge and skills will be presented in large groups. Attendance: 100%
- Theory - practice classes:Theory lessons and resolution of practical exercises. Attendance: 0%-100%
- Laboratory sessions: Small groups classes, in which problems proposed to the students are discussed and developed using the computer. Attendance: 0%-100%
- Tutorials: Tutorials in person (one-by-one) or videoconference. Attendance: 0%-100%
- e-Learning activities: forum about subjects, recorded-contents and other educational activities. Attendance: 0%
- Individual student's work: individual student's work to complete the rest of activities and to prepare the exams. Attendance: 0%

Teaching methodologies:

- Theoretical lectures to develop the main concepts of the subject
- Practical cases and problems that students must solve individually or in small groups
- Oral presentations and discussions in class under teacher moderation
- Practical work individually or in small groups
- e-Learning activities

For the practices and projects, students have to develop works on algorithms for front-office and risk measurement, such as discounted cash flow, plain vanilla products valuation, first-order sensitivities, etc.

These implementations will be carried out using programming languages and techniques more frequently used in the quantitative financial sector, focusing on performance and software extensibility.

ASSESSMENT SYSTEM

% end-of-term-examination/test:	60
% of continuous assessment (assigments, laboratory, practicals…):	40

Theory classes: 10%
Individual or groups projects during the course, presential or e-learning activities: 30%
Final Exam: 60% (a minimal grade of 3.5 is required in the exam)

BASIC BIBLIOGRAPHY

- John C. Hull Options, Futures, and Other Derivatives, Person Prentice Hall.

ADDITIONAL BIBLIOGRAPHY

- Gamma Erich, Helm Richard Design Patterns:Elements of Reusable Object-Oriented, Addison-Wesley Professional.

- Mark S. Joshi C++ Design Patterns and Derivatives Pricing, Cambridge University Press.

- Scott Meyers Effective Modern C+, O'Reilly Media.

- Scott Meyers Effective C++, Addison Wesley.