Stochastic processes

Academic Year: (2019 / 2020)   **Review date: 19-05-2020**

Department assigned to the subject: Statistics Department

Coordinating teacher: ALBARRAN LOZANO, IRENE

Type: Compulsory ECTS Credits : 6.0

Year : 1 Semester : 2

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Actuarial Statistics

OBJECTIVES

The goal of the course is to provide basic knowledge on Stochastic Processes used in actuarial and financial models, which are then used in subjects such as Survival Models, Life Insurance Pricing in General Insurance and those devoted to analysis Investment dynamic.

SPECIFIC RESPONSIBILITIES:
1. Theoretical and basic properties of Stochastic Processes
2. Main models of stochastic processes
3. Use of the models to represent and evaluate real situations.

Transversal competences:
1. Capacity for analysis and synthesis.
2. Knowledge of mathematical computing software.
3. Troubleshooting.
4. Teamwork.
5. Critical thinking.
6. Oral and written communication.

DESCRIPTION OF CONTENTS: PROGRAMME

The program content is divided into four themes:

#1. Introduction: Definition, basic notions and general classifications of probability and stochastic processes.
1.1.   Insurance application models.
1.2.   Techniques for calculating the risk premium.

2. Markov Chains
2.1. Introducction
2.2 Markov Chains in discrete time
2.3. Basic knowledge on Markov chains in continuous time.

3. Conditional expectation and martingales.
3.1. Introduction.
3.2. Martingales in discrete time: application to random walks.

4. Poisson processes and theory of renewal
4.1. Introduction
4.2. Insurance application models: Ruin theory.
4.3. Introduction to theory of renewal.

5. Brownian motion.
5.1. Introduction.
5.2. Martingale related to Brownian motion.
5.3. Finance Application models: binomial model and Black-Scholes model applied to financial derivatives.

LEARNING ACTIVITIES AND METHODOLOGY

Theory (4 ECTS)
Theoretical classes with support material available on the Web (a collection guides / slides and exercises, basic bibliographic material and supplementary material for further study those issues in which they are most interested). Will develop fundamental concepts and skills of the course that students must acquire, and solve exercises by the teacher, encouraging students' active participation in solving them (both individually and in teams).

PRACTICE (2 credits):
Problem-solving lessons. Computer labs. Presentations and debates.

ASSESSMENT SYSTEM

40% of the final grade corresponds to the continuous evaluation which consist of conducting two partial tests throughout the semester. The remaining 60% consist of a final exam.

Students who get good grades of continuous assessment will be released for the final exam. In this case, the note of continuos evaluation will be worth 100% of the final mark only if the contiuos evaluation be higher or equal to 5.

In extraordinary exams: the most favorable criteria will be applyed between the continuous assessment system and 100% of the final exam.

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

BASIC BIBLIOGRAPHY

- KIJIMA, M. Stochastic processes with applications to finance, Chapman & Hall., 2003

- ROLSKI, T., SCHMIDLI, H., SCHMIDT, V., TEUGELS, J. Stochastic Processes for Insurance and Finance, Wiley. , 1999

ADDITIONAL BIBLIOGRAPHY

- DURRET, R. Essential of Stochastic Processes, Springer, 1999

- KAO, E.P.C. An Introduction to Stochastic Processes, Duxbury Press, 1997

- ROSS, S.M. Stochastic Processes. , John Wiley., 1996

BASIC ELECTRONIC RESOURCES

- RINCÓN, L. . Introducción a los procesos estocásticos::
http://www.matematicas.unam.mx/lars/Publicaciones/procesos2012.pdf
- RINCÓN, L. . Introducción a la teoría del riesgo::
http://www.matematicas.unam.mx/lars/Publicaciones/riesgo2012.pdf