Stochastic Processes

Academic Year: (2019 / 2020) **Review date: 11-05-2020**

Department assigned to the subject: Statistics Department

Coordinating teacher: D AURIA , BERNARDO

Type: Compulsory ECTS Credits : 6.0

Year : 2 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Elementary Statistical Theory I
Elementary Statistical Theory II

OBJECTIVES

SPECIFIC SKILLS.
1. Knowing the theoretical foundations and the basic properties of stochastic processes.
2. Solve problems based on the studied stochastic models.
3. Simulating techniques for Markov Chains.

CUTTING SKILLS:
1. Capacity for analysis and synthesis.
2. Problem solving.
3. Critical Thinking.

DESCRIPTION OF CONTENTS: PROGRAMME

1 - Introduction
1.1 - Random Variables
1.2 - Random Vectors
1.3 - Conditioned Expectation
1.4 - Stochastic processes

2 - Markov chains in discrete time
2.1 Definition
2.2 State classification
2.3 Stopping times
2.4 Limit Theorems
2.5 Limit and stationary distributions

3 - Martingales in discrete time
3.1 Definition
3.2 Optional Stopping Theorem
3.3 Wald's Equation
3.4 Gambler's ruin problem

4 - Markov Chains in continuous time
4.1 Definition
4.2 State classification
4.3 Stopping times
4.4 Limit Theorems
4.5 Limit and stationary distributions
4.6 Poisson Process

5 - Stochastic Processes in continuous time
5.1 Definition and examples
5.2 The Brownian motion
5.3 Gaussian processes

LEARNING ACTIVITIES AND METHODOLOGY

Theory (4 ECTS). Lectures.
Practice (2 ECTS). Problem solving lessons.

ASSESSMENT SYSTEM

Ordinary call:
The course includes a continuous assessment by performing two partial tests throughout the semester.
The final grade of the course will be calculated giving a weight of:
- 60% to the final exam
- 40% to the continuous assessment

Release of final exam:
Students who get good grades in the continuous assessment are released from taking the final exam. In this case the continuous assessment mark will count 100% on the grade of the course.
To qualify for this evaluation in each of the partial tests the marks should be above or equal to 5.

Extraordinary call:
The evaluation system in the extraordinary session will be the higher of the following two criteria:
- 100% of the final exam
- Same evaluation as in the ordinary call

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

BASIC BIBLIOGRAPHY

- R. Durrett Essentials of stochastic processes, Springer, 2012 (2nd ed.)
- S.M. Ross Stochastic Processes, John Wiley & Sons, inc., 1996 (2nd. ed.)

BASIC ELECTRONIC RESOURCES

- R. Durrett . Essentials of Stochastic Processes: http://www.math.duke.edu/~rtd/EOSP/EOSP2E.pdf