Stochastic Processes

Academic Year: (2021 / 2022)   **Review date: 22-06-2021**

Department assigned to the subject: Statistics Department

Coordinating teacher: JIMENEZ RECAREDO, RAUL JOSE

Type: Compulsory ECTS Credits : 6.0

Year : 3 Semester : 2

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 - Continuous-time Stochastic Processes
4.1 Motivation
4.2 Various examples of processes with discrete state spaces.
4.3 Various examples of processes with continuous state spaces.
4.4 Applications

LEARNING ACTIVITIES AND METHODOLOGY
Theory (4 ECTS). Lectures.
Practice (2 ECTS). Problem solving lessons.

ASSESSMENT SYSTEM
Final examination 40%. The remaining 60% will be grade through continuous evaluation, which will consist of tests, assignments and projects. All tests can contain application exercises, theoretical questions, and questions on computational practices. The student obtains a good grade in the

continuous assessment may exempt the final exam.

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

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