

Academic Year: (2022 / 2023)

Review date: 31-05-2022

Department assigned to the subject: Statistics Department

Coordinating teacher: JIMENEZ RECAREDO, RAUL JOSE

Type: Compulsory ECTS Credits : 6.0

Year : 4 Semester : 1

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Probability (Year 2 - Semester 2)

DESCRIPTION OF CONTENTS: PROGRAMME

1. Introduction to Stochastic Processes.
 - 1.1. Basic Definitions and Notations.
 - 1.2. Examples: branching processes and queues.
 - 1.3. Review of Conditional Expectation.
 - 1.4. Review of Characteristic Functions and applications.
2. Discrete time Markov Chains.
 - 2.1. Basic Definitions and Notations.
 - 2.2 Chapman-Kolmogorov Equations and classification of states.
 - 2.3. Asymptotic results.
 - 2.4. First Step Analysis.
 - 2.5. Random Walks and Success Runs.
 - 2.6 The Geo/Geo/1 queue.
3. Renewal Theory and Poisson process.
 - 3.1 Definition and basic notions.
 - 3.2 The Elementary Renewal Theorem.
 - 3.3 The Key Renewal Theorem.
 - 3.4 The Delayed Renewal Theorem.
 - 3.5 Compound Poisson Process.
4. Continuous time Markov Chains.
 - 4.1 Definition and basic notions.
 - 4.2 Chapman-Kolmogorov Equations and Limit Theorems
 - 4.3 Birth and Death Processes (M/M/m queues).
5. Continuous time Markov Processes: Brownian Motion.
 - 5.1 Brownian Motion and Gaussian Processes.
 - 5.2 Variations and Extensions.
 - 5.3 Hitting times.
 - 5.4 Relation with Martingales.

LEARNING ACTIVITIES AND METHODOLOGY

- Clases magistrales: Presentación de conceptos, desarrollo de la teoría y ejemplos, 2.2 ECTS
- Clases de resolución de problemas: 2.2 ECTS
- Prácticas de ordenador: 0.6 ECTS
- Sesiones de evaluación (exámenes de evaluación continua y examen final): 1 ECTS

ASSESSMENT SYSTEM

40% of the final qualification is obtained in a final exam. The remaining 60% is the result of continuous evaluation based on the acquired abilities of the student by two midterm exams (40%), carry out practical data analyses, computer labs and explain the results they have obtained (20%).

In the extraordinary examination, the final grade will be the maximum between the previous system and 100% of the final exam.

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

BASIC BIBLIOGRAPHY

- 1. Moshe Haviv. A Course in Queueing Theory. , Springer, 2013
- Sheldon M. Ross. Stochastic Processes. , Wiley, 1995