

Academic Year: ( 2019 / 2020 )

Review date: 21-04-2020

Department assigned to the subject: Statistics Department

Coordinating teacher: VILLAGARCIA CASLA, TERESA

Type: Electives ECTS Credits : 6.0

Year : Semester : 2

**REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)**

Calculus I and II  
Algebra  
Statistics

**OBJECTIVES**

The course has two parts: Forecasting and reliability.

In the first part you learn to forecast variables. For example you can forecast the evolution of a company's sales, or monthly unemployment in Spain. We will use univariate ARIMA models.

In the second part you will learn to estimate the duration of processes and / or components. This is the basis of reliability analysis. We use parametric and nonparametric estimators for complete or censored data.

The course is absolutely applied and each week there is a theoretical lecture and practical class in computer room where you learn to use the techniques learned.

**DESCRIPTION OF CONTENTS: PROGRAMME**

1. Time Series Analysis.
  - 1.1 Introduction. Characteristics of a time series: Trend, homoscedasticity and seasonal cycle.
  - 1.2 Stationary Time Series.
  - 1.3 Transformation on non Stationary Time Series into Stationary Time Series.
  - 1.4 Simple and partial autocorrelation function.
  - 1.5 Models AR (1) AR (2) and AR (p)
  - 1.6 Models MA (1), MA (2) and MA (q)
  - 1.7 ARMA Models
  - 1.8 ARIMA Models
  - 1.9 Estimation and diagnosis.
  - 1.10 Forecasting
  - 1.11 Seasonal ARIMA Models
  - 12.1 Forecasting with seasonal ARIMA models
2. Reliability
  - 2.1 Introduction to duration data (ADS)
  - 2.1 Functions used: reliability function and failure rate
  - 2.3 Types of failure rates.
  - 2.4 Parametric models: Weibull
  - 2.5 Graphical Methods to determinate the model.
  - 2.6 Duration estimation for complete data.
  - 2.7 Censored Data. Types of censorship.
  - 2.8 Graphical methods for censored data. Kaplan Meier Estimator
  - 2.9 Parametric Estimation with censored data.
  - 2.10 Accelerated tests (under stress)
  - 11.2 Series and parallel systems. Introduction to complex systems.

**LEARNING ACTIVITIES AND METHODOLOGY**

Every week there are two lessons. A theoretical one that introduces various analysis techniques, and a practical one (in a computer room) where the learned technique are applied to real problems.

## ASSESSMENT SYSTEM

This course has two parts. At the end of each part there will be an exam. If this exam is passed the result is valid for the ordinary and extraordinary exams.

The students that pass both controls automatically pass the course.

Students who fail one or both parts shall take the final exam only for the failed parts.

<b>% end-of-term-examination:</b>	20
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	80

## BASIC BIBLIOGRAPHY

- Daniel Peña Análisis de Series Temporales, Alianza, 2005