Industrial Statistics

Academic Year: (2023 / 2024) **Review date: 26/04/2023 13:34:04**

Department assigned to the subject: Statistics Department

Coordinating teacher: AUSIN OLIVERA, MARIA CONCEPCION

Type: Electives ECTS Credits : 6.0

Year : 4 Semester :

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Calculus I and II
Algebra
Statistics

LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CB3. Students have the ability to gather and interpret relevant data (usually within their field of study) in order to make judgements which include reflection on relevant social, scientific or ethical issues.
CB5. Students will have developed the learning skills necessary to undertake further study with a high degree of autonomy.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG3. Ability to design a system, component or process in the field of Industrial Technologies to meet the required specifications
CG4. Knowledge and ability to apply current legislation as well as the specifications, regulations and mandatory standards in the field of Industrial Engineering.
CG5. Adequate knowledge of the concept of company, institutional and legal framework of the company. Organisation and management of companies.
CG6. Applied knowledge of company organisation.
CG8. Knowledge and ability to apply quality principles and methods.
CG9. Knowledge and ability to apply computational and experimental tools for the analysis and quantification of Industrial Engineering problems.
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA3. Engineering Design: To be able to design industrial products that comply with the required specifications, collaborating with professionals in related technologies within multidisciplinary teams.
RA4. Research and Innovation: To be able to use appropriate methods to carry out research and make innovative contributions in the field of Industrial Engineering.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.
RA6. Transversal Skills: To have the necessary skills for the practice of engineering in today's society.

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.

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

Theoretical classes where various analysis techniques are introduced and practical classes where studied techniques are applied to real problems using the computer

ASSESSMENT SYSTEM

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

Final exam (60%). Midterm exam (40%).

BASIC BIBLIOGRAPHY

- Daniel Peña Análisis de Series Temporales, Alianza, 2005