

Academic Year: ( 2022 / 2023 )

Review date: 31-05-2022

Department assigned to the subject: Statistics Department

Coordinating teacher: CASCOS FERNANDEZ, IGNACIO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Social Sciences and Law

## OBJECTIVES

By the end of this course, students will be able to have:

1. knowledge and understanding of the statistic principles underlying their branch of engineering;
2. the ability to apply their knowledge and understanding to identify, formulate and solve statistic problems using established methods;
3. the ability to apply their knowledge and understanding to analyse engineering products, processes and methods;
4. an understanding of statistics methodologies, and an ability to use them.
5. the ability to select and use appropriate statistic tools and methods;
6. the ability to combine theory and practice to solve engineering problems;
7. an understanding of applicable statistic techniques and methods, and of their limitations;

## DESCRIPTION OF CONTENTS: PROGRAMME

### BLOCK 0: DESCRIPTIVE STATISTICS

#### 0. Descriptive Statistics

### BLOCK I: PROBABILITY

#### 1. Introduction to Probability

##### 1.1 Introduction

##### 1.2 Random phenomena

##### 1.3 Definition of probability and properties

##### 1.4 Assessment of probabilities in practice

##### 1.5 Conditional probability

##### 1.6 Bayes Theorem

#### 2. Random variables

##### 2.1 Definition of random variable

##### 2.2 Discrete random variables

##### 2.3 Continuous random variables

##### 2.4 Characteristic features of a random variable

##### 2.5 Independence of random variables

### BLOCK II: PARAMETRIC MODELS AND INFERENCE

#### 3. Distribution models

##### 3.1 Binomial distribution

##### 3.2 Geometric distribution

##### 3.3 Poisson distribution

##### 3.4 Uniform distribution (continuous)

##### 3.5 Exponential distribution

##### 3.6 Normal distribution (with CLT)

#### 4. Statistical Inference

##### 4.1 Introduction

##### 4.2 Estimators and their distributions

##### 4.3 Confidence Intervals

##### 4.4 Hypothesis testing

##### 4.5 Particular tests on a single sample

##### 4.6 Comparison of two populations

### BLOCK III: APPLICATIONS

#### 5. Quality control

##### 5.1 Introduction, control charts

##### 5.2 Variables control charts, the X-bar chart

5.3 Attributes control charts, the p and np charts

6. Linear regression

6.1 Introduction

6.2 Simple linear regression

6.3 Multiple linear regression

#### LEARNING ACTIVITIES AND METHODOLOGY

- Lectures: introducing the theoretical concepts and developments with examples, 2.2 ECTS
- Problem solving sessions: 2.2 ECTS
- Computer (practical) sessions: 0.6 ECTS -- 4 SESSIONS
- Evaluation sessions (continuous evaluation and final exam): 1 ECTS

#### ASSESSMENT SYSTEM

The evaluation of the course will be based on continuous evaluation and a final exam with the weighting given below:

40% - final exam,

60% - continuous evaluation.

There is no requirement for a minimum score at any of these parts.

Continuous evaluation

There will be continuous evaluation by means of two midterm exams (40%+55%) and computer lab assignments (5%).

At the partial examinations there will be some questions about the computer sessions at those exams.

Final exam - regular session

- The final exam will consist of solving problems using all the tools learnt during the course.
- The final grade will be 60% continuous evaluation + 40% final exam

Final exam - extraordinary session

- The final exam will consist of solving problems using all the tools learnt during the course.
- The evaluation system in the extraordinary session will be the maximum between the following criteria:
  - a) 100% final exam
  - b) 60% continuous evaluation + 40% final exam

<b>% end-of-term-examination:</b>	40
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<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60
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#### BASIC BIBLIOGRAPHY

- MONTGOMERY, D.C., RUNGER, G.C. Applied Statistics and Probability for Engineers, John Wiley & Sons, 2003
- Navidi, W. Statistics for Engineers and Scientists, McGraw-Hill, 2006
- SONG, TT Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, 2004

#### ADDITIONAL BIBLIOGRAPHY

- GUTTMAN, L., WILKS, S.S., HUNTER, J.S. Introductory Engineering Statistics, Wiley, 1992