

## Course guide

# 240EQ313 - 240EQ313 - Experimental Planning and Statistical Treatment of Experimental Data

Last modified: 14/06/2023

**Unit in charge:** Barcelona East School of Engineering  
**Teaching unit:** 715 - EIO - Department of Statistics and Operations Research.

**Degree:** Academic year: 2023 ECTS Credits: 4.5  
**Languages:** Spanish

## LECTURER

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**Coordinating lecturer:** PEDRO GRIMA CINTAS

**Others:**

## REQUIREMENTS

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There are no prerequisites to take this course

## DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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### Specific:

1. Apply knowledge of mathematics, physics, chemistry, biology and other natural sciences, obtained through study, experience, and practice, critical reasoning to establish economically viable solutions to technical problems.

### Generical:

2. Know how to establish and develop mathematical models using appropriate informatics, scientific and technological basis for the design of new products, processes, systems and services, and for other already developed optimization.

## TEACHING METHODOLOGY

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The classes will be divided into two parts. The first will present new concepts and the second will practice using these concepts by performing exercises or activities with computer.

You must also perform a practical work. On this job you must make a report and an oral presentation.

## LEARNING OBJECTIVES OF THE SUBJECT

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After passing the course, students will be able to:

- Summarize the information contained in a large set of data using descriptive statistics techniques.
- Design plans for data collection and analysis in order to compare two or more treatments (Student's t test, analysis of variance).
- Designing experiments to study how a set of variables affect the output of a process (full and fractional factorial designs).
- Modelling possible relationships between variables using regression equations.

## STUDY LOAD

Type	Hours	Percentage
Self study	72,0	64.00
Hours small group	40,5	36.00

**Total learning time:** 112.5 h

## CONTENTS

### Presentation. Descriptive Statistics

#### Description:

Importance of the statistics in the industry world. Numerical synthesis of data. Graphical representations. Introduction to the statistical software program Minitab. Analysis of databases

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

### Normal distribution. Calculating probabilities in the normal distribution.

#### Description:

Random mathematical modelling. Most common models, the normal distribution and the possibilities of using the Normal distribution. Calculation of the probabilities with the Normal distribution. Exercises and problems

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

### Hypothesis testing and confidence intervals

#### Description:

Concept of parameter estimation. Point estimate and estimation of confidence interval. Concept of confidence interval. Reasoning system when a statistical test is carried out (Hypothesis testing).

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

### Comparison of treatments. Completely randomized and blocked designs

**Description:**

Statistical techniques to compare two treatments (is it worth to add an additive to improve the product obtained?) and more than two treatment (out of three raw materials, which one gives a better performance?)

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

### Full and fractional factorial designs

**Description:**

In view of the process as a black box, experimentation plans must be designed in order to analyse how the output variables(answers) vary regarding to the input variables (production factors)

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

### Correlation and regression. Models of simple and multiple regression

**Description:**

Analysis of the relation between variables. Creation of models (regression equations) to explain how a variable performs in function of another one (simple regression) or other (multiple regression)

**Full-or-part-time:** 17h 20m

Theory classes: 3h

Practical classes: 3h

Guided activities: 3h

Self study : 8h 20m

## ACTIVITIES

### RESOLUTION OF EXERCISES AND PROBLEMS

**Description:**

The students will have to carry out exercises and problems. These activities will be carried out individually or in groups. They will be handed in and will be discussed in class. Some of these activities will be evaluated

**Specific objectives:**

The students practice the knowledge which they have achieved and inform the Professor about the understanding level of these concepts

**Material:**

Each unit will have a set of exercises and problems

**Full-or-part-time:** 10h

Practical classes: 2h 30m

Guided activities: 2h 30m

Self study: 5h



### RESOLUTION OF PRACTICAL CASES

**Description:**

the students will have to understand a practical case describing an industry problem or real character. using a database which will be provided, they will have to decide the most suitable the statistical tools answer the questions set, using a statistical software

**Specific objectives:**

Acquire skills when working with data and with the use of statistical software programs. Identify the suitable statistical tools in each situation

**Full-or-part-time:** 4h

Practical classes: 1h

Guided activities: 1h

Self study: 2h

### INDIVIDUAL WORK

**Full-or-part-time:** 20h

Self study: 20h

### FINAL EXAM

## GRADING SYSTEM

The grade of the course will consist of 3 parts:

- NAC: Corresponding to the activities to be undertaken in class or as homework.
- NTR: Grade of the practical work
- NEX: Grade of the final exam

Final Grade: =  $0.3 \cdot \text{NAC} + 0.3 \cdot \text{NTR} + 0.4 \cdot \text{NEX}$

## BIBLIOGRAPHY

**Basic:**

- Box, George E. P ; HUnter, J.S. ; Hunter W.G.. Statistics for Experimenters. 2nd ed. Hoboken: Wiley, 2005. ISBN 0471718130.