UNIVERSITAT POLITÈCNICA DE CATALUNYA
BARCELONATECH

Course guide
240EQ313 - 240EQ313 - Experimental Planning and Statistical Treatment of Experimental Data

Last modified: 27/05/2024

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

Degree: **Academic year:** 2024   **ECTS Credits:** 4.5
Languages: Spanish

LECTURER

Coordinating lecturer: PEDRO GRIMA CINTAS

Others:

REQUIREMENTS

There are no prerequisites to take this course

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

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

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 presentaicon.

LEARNING OBJECTIVES OF THE SUBJECT

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 ordr 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 (Hyphotesis 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 knokwledge which they have achieved and inform the Professor about the understanding level of these concepts

Material:
Each unit will have a set of exericses and problems

Full-or-part-time: 10h
Self study: 5h
Guided activities: 2h 30m
Practical classes: 2h 30m

RESOLUTION OF PRACTICAL CASES

Description:
the students will have to understnad 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
Self study: 2h
Guided activities: 1h
Practical classes: 1h

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*NAC + 0.3*NTR + 0.4*NEX

BIBLIOGRAPHY

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