Universidad Zaragoza

Academic Year/course: 2024/25

25812 - Statistics and product reliability

Syllabus Information

Academic year: 2024/25
Subject: 25812 - Statistics and product reliability
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 558 - Bachelor's Degree in Industrial Design and Product Development Engineering
ECTS: 6.0
Year: 2
Semester: Second semester
Subject type: Basic Education
Module:

1. General information

The subject is part of the 2nd four-month period of the 2nd year, together with Economic and Business Aspects of Design, Electrical and Electronic Technology, Graphic Design Applied to Product and Design Workshop III: Creativity. A Module Project that integrates the five subjects is planned, in which with this subject you will learn how to carry outmarket research.

Inaddition, the student receives the basic knowledge of random variables and reliability of components and systems, so they receive training in probability calculus. The student acquires skills in basic inference techniques: contingencytables , confidence intervals and hypothesis testing.

2. Learning results

1. Be able to summarize and describe numerical and non-numerical information (data) either collected by him/herself or from different sources.

2. Be able to make a written analysis, in the form of a report, drawing justified conclusions about different variables and possible relationships between them.

3. Be able to solve typical problems of probability calculation using random variables with special emphasis on duration and failure (reliability) models.

4. Be able to apply basic statistical inference techniques: point and confidence interval estimation and hypothesis testing with real data.

3. Syllabus

PART I: Descriptive statistics:

- Basic concepts. Definition and classification of variables.
- Individual analysis of qualitative and quantitative variables. Frequency table. Graphical representations. Measures of location, dispersion and shape.
- Joint analysis of variables. Contingency table and independence test. Introduction to the regression analysis.

PART II: Probability and random variables:

- Probability, conditional probability, independence of events. Application of probability to the calculation of the reliability of systems.
- Definition of random variable. Classification.
- Characteristics of random variables.
- Discrete and continuous notable distributions.
- Poisson process and relationship with exponential and gamma distributions.
- Reliability and life time.

PART III: Statistical inference:

- Basic concepts.
- Point estimation and confidence interval estimation. Intervals for means, variances and proportions.

Hypothesis testing for means, variances and proportions.

4. Academic activities

Lectures: 30 hours of attendance. Theoretical-practical sessions in which the contents of the course are presented.

Computer laboratory practices: 30 hours of attendance. Troubleshooting with specific software.

Tutored work: 25 hours of practical work for the Module Project.

60 hours of study and problem solving.

5 hours of evaluation activities.

5. Assessment system

To pass the subject, the student must obtain a grade of at least 5 points out of 10 in each of the following tests:

Test 1. Descriptive statistics are evaluated through the market survey that is part of the Module Project (MP).

The groups must make an oral presentation, which is evaluated together with the written report. The market study grade is 20% and the PM grade is 10% of the total grade of the subject. This note is joint for the PM group. With this test learning results 1 and 2 are assessed.

Test **2**. The part of probability, random variables and reliability is evaluated with an individual written test carried out with computer that accounts for 40% of the total grade. Problems similar to those done in the practical sessions should be solved. This test assesses learning result 3.

Test **3.** The statistical inference part is evaluated by means of an individual written test carried out with a computer, which represents 30% of the total grade. The different techniques learned must be applied. This test assesses the learning results 1, 2 and 4.

Students who do not take the continuous assessment procedure have the option of passing test 1 through individual work and must take tests 2 and 3 in the overall assessment test.

The following aspects will be taken into account in the assessment of **test 1:**

- Formal aspects: presentation, structure, writing and spelling.
- Adequate analysis of the variables.
- Extraction of interesting conclusions.
- Public presentation (Module Project).

The following aspects will be considered in the assessment of **test 2:**

- Correct definition of the variables used in each exercise together with an adequate assignment of the model and its parameters.
- Correct approach to each exercise with the appropriate focus, development and conclusion.
- Mathematical rigor and correct notation in solving the exercises.
- Clean and clear writing.

The following aspects will be considered in the assessment of **test 3:**

- Ability to extract results numerically and graphically and provide the most appropriate analysis for each type of data.
- Ability to correctly interpret the analyses performed and to draw reasonable conclusions.

6. Sustainable Development Goals

9 - Industry, Innovation and Infrastructure
12 - Responsible Production and Consumption