

Academic Year/course: 2022/23

## 25812 - Statistics and product reliability

### Syllabus Information

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**Academic Year:** 2022/23

**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

## 2. Learning goals

### 2.1. Competences

#### BASIC COMPETENCES

CB01. Students have demonstrated knowledge and understanding in a field of study that is part of the general secondary education curricular, and is typically at a level which, although it is supported by advanced textbooks, includes some aspects that involve knowledge of the forefront of their field of study.

CB02. Students can apply their knowledge to their work or vocation in a professional manner and have competences typically demonstrated through devising and defending arguments and solving problems within their field of study.

CB03. Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgments that include an important reflection on social, scientific or ethical issues.

CB04. Students can communicate information, ideas, problems and solutions to both specialist and non-specialist audiences.

CB05. Students have developed those skills needed to undertake further studies with a high degree of autonomy.

#### GENERAL COMPETENCES

GC04. Ability to organize time effectively and coordinate activities to acquire new knowledge quickly and perform under pressure.

GC05. Capacity to collect, manage, analyze and synthesize information from various sources for the development of design projects and product development. Capacity to use this documentation to obtain conclusions aimed at solving problems and making decisions with initiative, creativity and critical thinking, in order to generate new product concepts, new ideas and solutions.

GC06. Ability to generate the necessary documentation for the proper transmission of ideas through graphics, reports and technical documents, models and prototypes, oral presentations in Spanish and other languages.

GC07. Ability to use and master techniques, skills, tools and techniques and communication and others specific of design engineering needed for design practice.

GC08. Ability to learn continuously, to develop autonomous learning strategies and to work in multidisciplinary groups with motivation and determination to achieve goals.

#### SPECIFIC COMPETENCES

SC01. Ability to solve mathematical problems that may arise in Engineering in Industrial Design and Product Development. Ability to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial differential; numerical methods; numerical algorithmic; statistical and optimization.

## 3. Assessment (1st and 2nd call)

## 4. Methodology, learning tasks, syllabus and resources

### 4.1. Methodological overview

In this semester, teachers use the teaching experience "teaching by means of modules", which aims to develop the degree competencies through teamwork and project-based learning (PBL). This teaching method integrates the different subjects in the semester so that the student understands the multidisciplinary nature of design and the need for using different skills to work on a project. Work is evaluated continuously and jointly by the group of teachers, in short periods of time called stages. In this subject, the module is done in the first five weeks. In the next ten weeks, the methodology proposed is designed to achieve a continuous assessment for the student and it is centered in practical aspects of statistics: work with real data.

There are sessions with all students in which the theoretical aspects are presented and there are also sessions with small groups in which the students work with a spreadsheet and statistical software. Students are expected to participate actively in the class throughout the semester. Classroom materials will be available via Moodle. These include a repository of the lecture notes used in class, the course syllabus, as well as other course-specific learning materials.

### 4.2. Learning tasks

The subject implies 4 hours/week for 15 weeks. Of these, 2 are taught to the entire group (theory sessions) and 2 are taught in small groups with a computer using a statistical software (practice sessions) according to the schedule of practices established by the center.

The 6 ECTS are:

- 30 hours for theory sessions.
- 30 hours for practice sessions using a computer and a statistical software.
- 40 hours for study and personal work.
- 50 hours for work group.

### 4.3. Syllabus

The course will address the following topics:

Section I: Descriptive statistics and module:

- Basic concepts. Definition and classification of variables.
- Survey for data collection. Installation of statistical software and files creation.
- Exploratory data analysis. Tables and graphic representations. Descriptive numerical measures.
- Introduction to the analysis of possible relationships between variables.

Section II: Probability, random variables and reliability:

- Basic probability.
- Definition and classification of random variables. Characteristics of random variables.
- Main discrete and continuous probability distributions.
- Basic concepts of reliability.

Section III: Statistical inference and relations among variables:

- Basic concepts of statistical inference. Inferences about means, variances, and proportions.
- Statistical test about more than two population means ANOVA.
- Contingency tables.
- Introduction to regression models.

### 4.4. Course planning and calendar

Week	Deadline
6	Group work: analysis of the market (Module)
11	Examination (Part II) (Continuous assessment)
Continuous assessment week	Examination (Part III) (Continuous assessment)

1st and 2nd assessment call	Final Examination of the semester.
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#### 4.5. Bibliography and recommended resources

<https://psfunizar10.unizar.es/br13/egAsignaturas.php?codigo=25812>