General overview of the module

We will learn how to analyse different datasets with a meaningful approach in business and management. Firstly, we will study how to perform descriptive analysis based on univariate and bivariate statistics. Next, we will make a brief introduction to probabilities and we will describe some theoretical concepts, such as Bayes’ theorem. This topic will set up the basics for the definition of a general probability distribution. However, we will focus on the most frequently used distributions: Poisson, binomial, uniform, exponential and normal distribution. We finally will describe how to conduct hypothesis test, especially as regards to inferential statistics for one sample, and two samples. We will finish the course through the description of analysis of variance (ANOVA) for comparing different samples. The statistical tools and knowledge included within this subject will be the starting point of the subsequent subjects: Statistics II.

Key Information

- **Module Code:** 13604
- **Module Title:** Statistics I
- **Credit Points:** 4
- **Module Status:** Compulsory
- **Module Block:** Basic Knowledge
- **Course Title:** BSc in Engineering and Management
- **Module Theme:** Mathematics

Faculty

**Lecturer**
Esther Cabezas-Rivas

**Tutorial hours**
Tuesday from 12 to 14 (by appointment)

Recommended prior knowledge

<table>
<thead>
<tr>
<th>Code</th>
<th>Module</th>
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<tbody>
<tr>
<td>13601</td>
<td>Cálculo</td>
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<tr>
<td>13609</td>
<td>Informática</td>
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Required Reading:

- Applied Statistics and Probability for Engineers. Douglas C. Montgomery & George C. Runger
- Applied statistics for engineers and scientists. Jay Devore & Nicholas Farnum
Module objectives – Learning outcomes

**KEY COMPETENCES**
- CB5 Develop learning competences for lifelong learning.
- 02 Apply technologies, skills and economic tools for engineering and management.
- 03 Define, solve and describe complex technical problems.
- 04 Learn how to analyse different components which influence decision making processes.
- 05 Communicate using scientific languages, based on graphical and symbolic elements used in engineering and management.

**SPECIFIC COMPETENCES**
- 13 Solve mathematical problems through the application of knowledge of algebra, linear algebra, geometry, differential geometry, differential and integer calculus, differential and partial equations, numerical methods, numerical algorithms, statistics and optimizations.

Teaching and learning units

1. **Descriptive statistics**
   - 1.1. Introduction to statistics
   - 1.2. Univariate descriptive statistics
   - 1.3. Bivariate descriptive statistics

2. **Probabilities**
   - 2.1. Events and probabilities
   - 2.2. Conditional probability and independent events
   - 2.3. Law of Total Probability and Bayes' theorem

3. **Probability distributions**
   - 3.1. Definition, types of distributions
   - 3.2. Discrete probability distributions:
     - 3.2.1. Binomial distribution
     - 3.2.2. Poisson distribution
     - 3.2.3. Uniform distribution
   - 3.3. Continuous probability distributions:
     - 3.3.1. Exponential distribution
     - 3.3.2. Normal distribution

4. **Inferential statistics**
   - 4.1. Hypothesis tests
   - 4.2. One sample inference
   - 4.3. Two – sample inference

Teaching and learning methods

<table>
<thead>
<tr>
<th>Unidad Didáctica</th>
<th>Teoría aula</th>
<th>Práctica aula</th>
<th>Práctica laboratorio</th>
<th>Práctica campo</th>
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<th>Trabajo autónomo del alumno</th>
<th>TOTAL HORAS</th>
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Assessment

<table>
<thead>
<tr>
<th>Overview</th>
<th>Nº of activities</th>
<th>Weighting (%)</th>
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<tbody>
<tr>
<td>Continuous assessment</td>
<td></td>
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<tr>
<td>Academic assignments.</td>
<td>Max. 3</td>
<td>20</td>
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<tr>
<td>Multiple choice tests.</td>
<td>Max. 4</td>
<td>20</td>
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<tr>
<td><strong>Exam</strong></td>
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<td>Written open answer questions</td>
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<td>Multiple choice tests.</td>
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</table>
Student evaluation will consist of both continuous and summative assessments:

1. Continuous assessment: The submission of practical work either carried out individually or in groups and participation in the different activities both inside the classroom, such as the analysis, summation and discussion of required readings, and outside including company visits, will account for this mark. This part of the assessment carries a weighting of 40% towards the final mark.

2. Summative assessment: These tests can combine both theoretical and practical content. This part of the assessment carries a weighting of 60% towards the final mark.

Continuous assessment is attendance based and non-recoverable. Therefore, the mark obtained for this part of the assessment will serve for both the first summative assessment and any subsequent repeat if required. The repeat will only be available at the end of the semester.

In order to pass the module an average of more than 5 in summative tests must be obtained. The final mark will be calculated by the average weightings of the summative assessment in combination with the continuous assessment. The final mark achieved must be 5 or above to pass the module.

Attendance is compulsory to ensure that you extract the most value from the module and meet the learning requirements. Therefore, session absence accounting for more than 15% of the prescribed hours will result in the inability to be awarded a mark for continuous assessment. Consequently, the maximum mark that can be achieved will be that obtained solely from the summative assessments.

Students enrolling in the module for the second time will receive specific instructions from their lecturer on what is required for them to pass the continuous assessment element. The final mark will be obtained by combining the summative assessment (80%) and the continuous assessment (20%), having to gain a final mark equal to or greater than 5 to pass the module.

All students must comply with the rules of writing, spelling and grammar in the development of their work and their assessment tests.