Course: Statistics I  
Code: 10BBA40000

Type: Required  
Course: 1  
Semester: 2

ECTS Credits: 6  
Language: Spanish

Coordination:

Faculty:  
Rosa Varela Otero

Course requirements:

Mathematics

Previous knowledge:

The concept of real function, continuity and derivability and their applications.  
The concept of the definite integral. Calculating primitives of elementary functions.

Workload distribution:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lectures</td>
<td>40.5  hours</td>
</tr>
<tr>
<td>Participatory Sessions</td>
<td>21    hours</td>
</tr>
<tr>
<td>Independent study</td>
<td>112.5 hours</td>
</tr>
<tr>
<td>Tutorials / feedback</td>
<td>6     hours</td>
</tr>
</tbody>
</table>

Course contribution to the programme:

Statistics is an essential tool in decision-making in environments where the amount of data and/or level of uncertainty makes it difficult to directly extract the information. This course provides some of the theoretical and practical bases needed for a realistic approach to decision making in uncertainty.

Course learning objectives:

By the end of this course, students should be able to:

- Use statistical reasoning in practical applications.
- Understand the various branches, concepts and statistical techniques to be able to use them in the appropriate situations.
- Relate the subject to other subjects being studied and to their future professional life.
- Summarise information from a group of data using univariate and bivariate descriptive statistical techniques.
- Produce descriptive statistical reports.
- Use probability calculus and probability models in decision-making.
- Apply techniques learned ethically.

Arising from these general objectives, a number of more specific objectives will be approached during the course, connected to the development of specific competences:

A. Presenting frames of reference, theory and tools and the keys for their use in analysing situations.
B. Using theoretical concepts and models in specific situations.
C. Becoming familiar with tools connected to the subject.
D. Applying what has been learnt to real situations.
E. Structuring and consolidating knowledge.
F. Valuing learning, and becoming aware of the aspects that must be considered for various reasons (difficulty, strong point, etc.).

Skills developed:
- The ability to acquire, understand and structure knowledge critically.
- The ability to apply knowledge to achieve results.
- The ability to communicate information and/or knowledge
- The ability to work in a team and collaborate.

Contents and methodology:
BLOCK 1: Introduction
1.1. Course introduction
1.2. Historical introduction. Descriptive statistics, the theory of probability and statistical inference
1.3. Basic concepts: Population vs. sample; parameter vs statistic; statistical variable vs. random variable

BLOCK 2: Descriptive statistics
2.1. Scales of measurement.
2.2. One-dimensional statistical variables: Frequency distribution and graphs.
2.3. Two-dimensional statistical variables:
  - Contingency tables and graphic representations.
  - Study of the degree of relation between numeric variables. Regression curve.

BLOCK 3: Probability
3.2 Events: Types and operations.
3.3 Probability axioms. Properties
3.3. Conditional probability: event dependence and independence.
3.4. Total probabilities and the Bayes formula. Probability trees.

BLOCK 4: One-dimensional random variables: Discrete
4.1. Random variables: Definition, distribution function and classification of random variables.
4.2. Characterisation of discrete random variables: probability function, expectation, variance, Chebyshev's inequality.
4.3. Functions of a discrete one-dimensional random variable: expectation.
4.5. Discrete models: Binomial, hypergeometric, geometric and Poisson

BLOCK 5: One-dimensional random variables: continuous and mixed
5.1. Characterisation of continuous and mixed random variables: density function, expectation and variance.
5.2. Functions of a continuous one-dimensional random variable: expectation.
5.3. Continuous models: Uniform, exponential, normal. Central limit theorem.

BLOCK 6: Two-dimensional and multi-dimensional random variables

6.1. Introduction.
6.2. Discrete two-dimensional variables: Joint, marginal and conditional distribution. Dependence and independence.
6.3. Continuous two-dimensional variables: Joint, marginal and conditional distribution. Dependence and independence.
6.4. Functions of a two-dimensional random variable: expectation.

ACTIVITIES:

Block 1: 1.5 hours of lectures
Block 2: 6 sessions of 1.5 hours of lectures and 4 sessions of 1.5 hours of participatory class.
Block 3: 4 sessions of 1.5 hours of lectures and 2 sessions of 1.5 hours of participatory class.
Block 4: 5 sessions of 1.5 hours of lectures and 3 sessions of 1.5 hours of participatory class.
Block 5: 5 sessions of 1.5 hours of lectures and 3 sessions of 1.5 hours of participatory class.
Block 6: 5 sessions of 1.5 hours of lectures and 2 sessions of 1.5 hours of participatory class.
General revision of the course: 1 session of 1.5 hours

Lectures: The Professors combine theoretical presentations with exercises.

Participatory classes: The work to be done can be divided into three areas. At the beginning of the session, the Professors will clarify any doubts that have come up during the individual solving of the exercises set. The students will then work in groups (of three or four, assigned at the beginning of the course) to solve an exercise set that same day. Every two weeks, the students will do a test on the work covered in the previous sessions.

Compulsory tutorials: Two or three times during the course, at the end of Thursday’s class, the student must remain behind for half an hour so that the Professor can assess his or her individual work in the exercise done in the group, and his or her learning process. This will not be announced in advance, so students are advised not to schedule any other activities at that time.

Voluntary tutorials for those students requiring them.

Evaluation:
The assessment system for competences uses a number of tools: weekly tests, exams, set exercises, class participation, production and submission of reports and so on.

In all cases, evaluation is seen not simply as a summative tool, but also as an educational one; this is why the faculty will be focusing on evaluation of the students’ progress as a process to be measured continuously.

For each objective/competence to be assessed, there are specific educational activities, tools and assessment criteria which correspond to it, and the weighting (in %) of the aspect in question in the overall qualification for the course.

A. Frames of reference, theories and tools, and keys to their use in analysis of situations are all presented in the lecture classes. Assessment will be through tests in the participatory sessions (continuous evaluation), compulsory tutorials and the final exam.
B. The correct use of the concepts and theoretical models in specific situations can be achieved by doing the exercises to be solved both individually and in the participatory sessions. These will be assessed in the participatory class from the work done in groups, in the compulsory tutorials, through tests and in the final exam.

C, D and E. These will be assessed in the participatory class from the presentation of work done, through tests and in the final exam.

F. Evaluating learning will be done through the compulsory and voluntary tutorials.

The final grade will be reached using the various evaluation tools:

a) If the exam grade is 4 or over, the final grade will be:
   - 30%: tests, exercises and class participation.
   - 70%: exam.

b) If the exam grade is below 4, the final grade will be that of the exam.

If the final grade is below 5, the student can resit one single exam, which will represent 100% of the grade.

Acquisition of the skills covered by the course will be through the weekly tests, the final exam, assessment from colleagues in the work group and from the compulsory and voluntary tutorials.

Assessment of your performance during the course will take into consideration the acquisition of the learning objectives, on a scale of 0 to 10. Information relating to the development of competences worked on throughout the course may be considered in the 0 to 10 grade, and will also be reflected from A to D in an independent indicator. The indicator will be incorporated into all the courses, and will be used to monitor each student’s progress throughout the programme.

**Core bibliography:**

This can be seen as the course textbook, and throughout the course, references to various chapters both as a theory book and as a means of solving the exercises

**Further material and bibliography:**