Learning objectives of the subject

After completing the course, students will be able to transform data into useful information for decision-making (Business Analytics) information. In particular you will be able to:
- Prepare a set of data for statistical analysis, detecting and treating missing data, and identifying extreme or erroneous values.
- Describe and display characteristics and interest amounts of multidimensional data sets, levels and variability.
- To detect significant relationships between data from the same or different kinds, numerically and graphically summarize these relationships.
- Use analytical techniques for unsupervised learning to describe, visualize and summarize relationships and
multidimensional data.
- Using statistical models (decision trees, regression) to aid decision making.
- Analyze the risks of business management through simulation models using the Monte Carlo method in different areas of the company (sales, finance, marketing, operations) and project management (cost and time).

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 125h</th>
<th>Hours large group: 15h</th>
<th>12.00%</th>
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<tbody>
<tr>
<td></td>
<td>Hours medium group:</td>
<td>5h</td>
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<td>Hours small group:</td>
<td>5h</td>
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<td></td>
<td>Guided activities:</td>
<td>10h</td>
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<td>Self study:</td>
<td>90h</td>
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## 310510 - Statistics Applied to Making Decisions

<table>
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<tr>
<th>title english</th>
<th>Learning time: 125h</th>
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<tr>
<td></td>
<td>Theory classes: 46h</td>
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<td>Laboratory classes: 20h</td>
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<td>Guided activities: 19h</td>
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<td>Self study: 40h</td>
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**Description:**


1. Introduction (2 hours).
1.a Decisions in companies and projects.
1.b From the Data to the Information. Business analysis.
1.c From the Information to the Prediction. Predictive analysis.
1.d From the Uncertainty to the Calculated Risk. Analysis of the Hazards.
1.e Applications.

FIRST PART: BUSINESS ANALYSIS
2. Descriptive univariate statistics (2 hours).
2.a Type of data.
2.b Empirical distribution.
2.c Measures of localization and variability.
2.d Analysis of distributions. Untypical and extreme values.
2.e Graphical representation of variables.

3. Descriptive bivariate statistics (4 hours).
3.a Intersection between two qualitative variables.
3.a.1 Contingency tables.
3.a.2 Dependence measures.
3.b Relations between a qualitative variable and a quantitative variable.
3.b.1 Medians and conditional variances.
3.b.2 Correlation.
3.b.3 Visualisation.
3.c Relations between two quantitative variables.
3.c.1 Graphical representation: the scatterplot.
3.c.2 Measurement of the relation: the lineal correlation.
3.c.3 From the relation to the prediction: the lineal adjustment.
3.c.4 Extensions: bivariate analysis.

4. Analysis in principal components (6 hours).
4.a Objectives of the analysis in principal components (ACP).
4.b Selection of variables (active and auxiliary).
4.b.1 Visualisation of the relations by pairs of variables.
4.b.2 Transformation and standardisation of variables.
4.c Geometric interpretation.
4.c.1 Representation of the cases.
4.c.2 Representation of the variables.
4.d Selection and interpretation of the components.
4.d.1 Number of components.
4.d.2 Interpretation of the components.
4.e Whole visualisation.
4.e.1 Representation of the continuous variables in principal planes.
4.e.2 Representation of the cases in principal planes.
4.e.3 Representation of categorical auxiliary variables.

5. Association of individuals and segmentation (4 hours).
5.a Analysis of conglomerates.
5.a.1 Hierarchic methods.
5.a.2 Non-hierarchic methods.
5.b Application of the components of a ACP.
5.b.1 Establishment of the number of classes in hierarchic analysis.
5.b.2 Consolidation of partitions in non-hierarchic analysis.
5.c Interpretation of the partitions.
5.c.1 Relation between the classes and the components of the ACP.
5.c.2 Relation between the classes and the continuous variables.
5.c.3 Relation between the classes and the categorical variables.
SECOND PART: PREDICTIVE ANALYSIS
6.a Samples and populations.
6.b Estimation of points.
6.b.1 Estimation of a proportion.
6.b.2 Estimation of the median.
6.c Confidence intervals.
6.c.1 Confidence interval for a proportion.
6.c.2 Confidence interval for the median.
6.d Formulation and statistical hypothesis testing.
6.d.1 Statistical hypothesis testing in the business practice.
6.d.2 Tests for medians and proportions.
6.d.3 Tests to compare independent groups.
6.d.4 Tests to compare paired groups.
7.a Linear regression (8 hours).
7.a Simple linear regression.
7.a.1 Data generating process (assumption).
7.a.2 Calculation of the coefficients.
7.a.3 Validation of a regression model.
7.a.4 Quality of the adjustment.
7.a.5 Utilization of the results.
7.b Multiple linear regression.
7.b.1 Data generating process (assumption).
7.b.2 Calculation of the coefficients.
7.b.3 Validation of the regression model.
7.b.4 Quality of the adjustment.
7.b.5 Utilization of the results.
7.c Extensions.
7.c.1 Introduction of categorical independent variables.
7.c.2 Interaction between variables.
7.c.3 Temporary series.
THIRD PART: HAZARD ANALYSIS
8. Risk and uncertainty (4 hours).
8.a Risks in companies and in projects.
8.a.1 Statistical analysis of the risk.
8.a.2 Management of the risks.
8.b What-if analysis (what happens if).
8.b.1 Construction of scenarios.
8.b.2 Basic, worst and best scenario.
8.b.3 Limits of the What-If a

Related activities:
Practical exercises supervised.
Workshops.
Oral presentation of studies, conclusions and proposals.
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Qualification system

The main evaluation systems are:
- Mark of proposed works during the practical classes.
- Mark of the workshops prepared and expounded by the students.
- Mark of the written test of control of knowledges.

Regulations for carrying out activities

For the works proposed during the practical classes (30%), there will be facilitated the most possible the delivery by telematic means, by Atenea.
In the case of the workshops (30%), the delivery of the works, previously to their exposition, will be done by telematic means, through Atenea; the exposition of the works will be done in-person.
Regarding the written test of control of knowledge (40%), it will be done in-person.

Bibliography

Basic:

Complementary: