Degree competences to which the subject contributes

Specific:
3096. Ability to solve the types of mathematical problems that may arise in engineering. Ability to apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential equations and partial derivatives; numerical methods; numerical algorithms; statistics and optimisation.

Transversal:
592. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.
595. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.
599. EFFECTIVE USE OF INFORMATION RESOURCES - Level 3. Planning and using the information necessary for an academic assignment (a final thesis, for example) based on a critical appraisal of the information resources used.
602. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.
584. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Teaching methodology
L'assignatura consta de 5 hores a la setmana de classes presencials a l'aula.

Es dediquen a classes teòriques el 45% de les hores setmanals en grup gran, en què el professorat exposa els conceptes i materials bàsics de la matèria, presenta exemples i realitza exercicis.

Es dediquen 25% de les hores setmanals, a la resolució de problemes. Es realitzen exercicis pràctics per tal de consolidar

Learning objectives of the subject
Students will acquire the skills to represent and process data, including basic knowledge of databases and computer
software with applications in engineering. They will also learn statistical concepts.

Upon completion of the course, students will have acquired the ability to: 1. Carry out a data analysis of a construction engineering problem using a computer tool that employs the studied techniques. 2. Carry out a multiple linear regression analysis using computer software. 3. Carry out data simulations and transformations of random variables, as well as studies of distributions.

Data analysis; Regression models, parameter estimation; Probability and uncertainty; Basics of point estimation and interval estimation; Hypothesis testing

**Study load**

<table>
<thead>
<tr>
<th>Total learning time: 187h 30m</th>
<th>Theory classes: 34h 18.13%</th>
<th>Practical classes: 15h 8.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory classes: 26h 13.87%</td>
<td>Guided activities: 7h 30m 4.00%</td>
<td>Self study: 105h 56.00%</td>
</tr>
</tbody>
</table>
## Content

<table>
<thead>
<tr>
<th>Exploratory data analysis</th>
<th>Learning time: 36h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h 30m</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 3h 45m</td>
</tr>
<tr>
<td></td>
<td>Laboratory classes: 3h 45m</td>
</tr>
<tr>
<td></td>
<td>Self study: 21h</td>
</tr>
</tbody>
</table>

### Description:


Study and graphical representation. Analysis of the trend. Components. Smoothing and seasonal index computations.

Study and graphical representation. Analysis of the trend. Components. Smoothing and seasonal index calculations.

Study and graphical representation. Analysis of the trend. Components. Smoothing and seasonal index calculations.
<table>
<thead>
<tr>
<th>Elementary Probability. Probability models.</th>
<th>Learning time: 48h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elementar Probability. Probability models.</td>
<td>Theory classes: 7h 30m</td>
</tr>
<tr>
<td>Counting techniques. Definition of probability. Conditional probability. Bayes Formula.</td>
<td>Practical classes: 3h 45m</td>
</tr>
<tr>
<td>Counting techniques. Discrete Probability. Conditional probability. Bayes Formula.</td>
<td>Laboratory classes: 8h 45m</td>
</tr>
</tbody>
</table>

**Description:**
Discrete distributions: Bernoulli, binomial, geometric, Poisson, ...
Representation of probability functions.

Discrete distributions: Bernoulli, binomial, geometric, Poisson, ...
Representation of probability functions.

Discrete Distributions: Bernoulli, binomial, geometric, Poisson, ...
Representation of probability functions.

Continuous models: uniform, normal, exponential, ... Central limit theorem. Processing methods.
Representation of densities. Point processes in time. Return periods.

Continuous models: uniform, normal, exponential, ... Central limit theorem. Processing methods.
Representation of densities. Point processes in time. Return periods.
Continuous models: uniform distribution, normal, exponential, ... Central limit theorem. Transforming variables.
### Statistical Inference

**Learning time:** 36h  
Theory classes: 7h 30m  
Practical classes: 3h 45m  
Laboratory classes: 3h 45m  
Self study: 21h

**Description:**  
Examples of estimation.


Concept of contrasting hypotheses  
Applications in normal sampling. Decision rules. Errors type I and II. Power. Contrasts of mean and variance of normal populations. T distributions, Chi2, F.  
Estimate p-value.

### Linear regression model

**Learning time:** 60h  
Theory classes: 11h 30m  
Practical classes: 3h 45m  
Laboratory classes: 9h 45m  
Self study: 35h

**Description:**  
Regression model and its extensions. Adjustment by least squares. Common model assumptions  
Regression model and its extensions. Adjustment by least squares. Common model assumptions  
First example. F tests on the regression. T Test on coefficients. Normality of residuals.  
First example. F tests on the regression. T Test on coefficients. Normality of residuals.  
First example. F tests on the regression. T Test on coefficients. Normality of residuals.  
Multiple regression. ANOVA. Factors.

Multiple regression. ANOVA. Factors  
Multiple regression. ANOVA. Factors.  
Review and synthesis of the contents of theory, problems and laboratory of issues 3 and 4. Evaluation of them by conducting written tests.  
Review and synthesis of the contents of theory, problems and laboratory issues 1, 2, 3 and 4. Final evaluation of them by conducting written tests for students that fail or to improve the final qualification.
Qualification system

The mark of the course is obtained from the ratings of continuous assessment that consist in several activities carried out during the semester. The assessment tests consist of a part with questions on concepts associated with learning objectives in terms of subject knowledge and understanding, and applying a set of exercises (problems and practical exercises with computer). The percentages allocated to each part are: theoretical concepts (25%), practical exercises with the aid of a computer (25%) and problems (50%).

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

Regulations for carrying out activities

Failure to perform or continuous assessment activity in the scheduled period will result in a mark of zero in that activity.

Bibliography

Basic:


Complementary:
