Course guide
330059 - ES - Statistics

Unit in charge: Manresa School of Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree:
BACHELOR’S DEGREE IN CHEMICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN ELECTRICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN INDUSTRIAL ELECTRONICS AND AUTOMATIC CONTROL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN MECHANICAL ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR’S DEGREE IN MINERAL RESOURCE ENGINEERING AND MINERAL RECYCLING (Syllabus 2021). (Compulsory subject).

Academic year: 2022 ECTS Credits: 6.0 Languages: Catalan

LECTURER

Coordinating lecturer: JOSEP RUBIÓ MASSEGÙ

Others:
Alsina Aubach, Montserrat
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Domínguez Díaz, Ricard
Freixanet De La Iglesia, Maria Josep
Freixas Bosch, Josep
Gilibets Palau, Inmaculada
Gimenez Pradales, Jose Miguel
Puente Del Campo, Maria Albina
Rossell Garriga, Josep Maria
Samaniego Vidal, Daniel
Sanchis Ferri, Francisco Miguel
Ventura Capell, Enric

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
1. CE1: Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge about: linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial differential equations, numerical methods, numerical algorithms, statistics and optimization.

Transversal:
2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.
3. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.
4. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
TEACHING METHODOLOGY

In the content exposition sessions, the teacher will introduce the theoretical bases of the subject, concepts, methods and results and will illustrate them with suitable examples to facilitate understanding.

The students will have to study independently to assimilate the concepts, solve the proposed exercises either by hand or with the help of the computer.

Small group face-to-face sessions where the teacher will solve the doubts that the students have after their autonomous study, and/or there will be practices.

Activities A1, A2 and A3 are part of the small group face-to-face sessions while tests E1 and E2 are part of the large group face-to-face sessions.

LEARNING OBJECTIVES OF THE SUBJECT

Upon completion of the Statistics course, the student must be able to:
- Solve problems related to probability and statistics fluently.
- Use with good criteria the appropriate statistical tools for modeling and problem solving.
- Manipulate data, apply suitable theoretical methods and draw conclusions from the results obtained.
- Use appropriate software to solve statistical problems.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

CONTENTS

1. DESCRIPTIVE STATISTICS

Description:

Related activities:
Test E1 and Activity A1

Full-or-part-time: 30h
- Theory classes: 6h
- Laboratory classes: 6h
- Self study: 18h
2. PROBABILITY AND RANDOM VARIABLES

Description:
Notion of probability, conditional probability, total probability and Bayes formula: applications. Probability, density and distribution functions. Reliability of a system. Expected value and variance of a random variable.

Related activities:
Test E1 and Activity A2

Full-or-part-time: 30h
Theory classes: 6h
Laboratory classes: 6h
Self study: 18h

3. NOTABLE DISTRIBUTIONS

Description:

Related activities:
Test E2 and Activity A2

Full-or-part-time: 30h
Theory classes: 6h
Laboratory classes: 6h
Self study: 18h

4. FUNDAMENTALS OF STATISTICAL INFERENCE

Description:

Related activities:
Test E2 and Activity A3

Full-or-part-time: 40h
Theory classes: 8h
Laboratory classes: 8h
Self study: 24h

5. QUALITY CONTROL AND MAIN COMPONENTS

Description:

Related activities:
Test E2 and Activity A3

Full-or-part-time: 20h
Theory classes: 4h
Laboratory classes: 4h
Self study: 12h
ACTIVITIES

A1: DESCRIPTIVE STATISTICS

Description:
Activity to be done in the computer class individually.

Specific objectives:
At the end of the activity the student must be able to:
1. Use a statistical package to descriptively analyze a data set.
2. Organize and graphically represent a collection of data to interpret it correctly.
3. Calculate interpret the numerical descriptive measures of a data set.
4. Investigate the relationship between two variables.

Material:
Software available in the computer class.
Practice scripts, problem lists and miscellaneous material available at ATENEA.

Delivery:
The solved practice must be given to the teacher. The realization of this test is necessary to pass the subject by course. It represents a part of the continuous evaluation of laboratory teaching.

Full-or-part-time: 4h
Laboratory classes: 1h
Self study: 3h

A2: PROBABILITY, RANDOM VARIABLES AND NOTABLE DISTRIBUTIONS

Description:
Activity to be done in the computer class individually.

Specific objectives:
At the end of the activity the student must be able to:
1. Use a statistical package to simulate random variables.
2. Calculate probabilities associated with notable distributions.
3. Approximate distributions using the Central Limit Theorem.

Material:
Software available in the computer class.
Practice scripts, problem lists and miscellaneous material available at ATENEA.

Delivery:
The solved practice must be given to the teacher. The realization of this test is necessary to pass the subject by course. It represents a part of the continuous evaluation of laboratory teaching.

Full-or-part-time: 4h
Laboratory classes: 1h
Self study: 3h
A3: STATISTICAL INFERENCE AND QUALITY CONTROL

Description:
Activity to be done in the computer class individually.

Specific objectives:
At the end of the activity the student must be able to:
1. To estimate punctually and by interval the population parameters of the remarkable distributions.
2. Make decisions using hypothesis tests.
3. Identify situations for which quality improvement tools are useful.
4. Use a statistical package to achieve the objectives set out in the previous points.

Material:
Software available in the computer class.
Practice scripts, problem lists and miscellaneous material available at ATENEA.

Delivery:
The solved practice must be given to the teacher. The realization of this test is necessary to pass the subject by course. It represents a part of the continuous evaluation of laboratory teaching.

Full-or-part-time: 4h
Laboratory classes: 1h
Self study: 3h

E1 AND E2: WRITTEN TESTS

Description:
Individual tests in class related to the learning objectives of the contents of the subject.

Specific objectives:
Evaluate the general assimilation of the objectives of contents 1, 2, 3, 4 and 5.

Material:
Test statements (delivered at the time of the test)

Delivery:
The solved test must be given to the teacher. It represents a part of the continuous evaluation of the specific contents of the subject.

Full-or-part-time: 16h
Theory classes: 4h
Self study: 12h

GRADING SYSTEM

The qualification is obtained from the NE mark, corresponding to the E1 and E2 tests, and the NA mark corresponding to the activities A1, A2 and A3.

The objectives of the subject will be considered achieved if the final grade of the continuous assessment: \( N_c = 0.7 \times NE + 0.3 \times NA \) is greater than or equal to 5.

Students with a course grade (Nc) lower than 5 can take a comprehensive exam (grade: Ng). The student's final grade will be \( N_f = \max(Nc, Ng) \).
EXAMINATION RULES.

All tests and activities are mandatory.
If any of the tests or activities of the subject is not carried out, it will be considered a grade with zero.

BIBLIOGRAPHY

Basic:

Complementary: