340354 - ESTA-C3O43 - Statistics

Coordinating unit:	340 - EPSEVG - Vilanova i la Geltrú School of Engineering
Teaching unit:	749 - MAT - Department of Mathematics
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (Teaching unit Compulsory) BACHELOR'S DEGREE IN ELECTRONIC SYSTEMS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory) BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits:	6 Teaching languages: Catalan

Teaching staff

Coordinator:	Enric Trullols
Others:	Enric Trullols

Prior skills

Ability to apply the basic tools of differential and integral calculus in one real variable.

Requirements

FOMA

Degree competences to which the subject contributes

Specific:
1. CE1. Ability to solve arithmetic problems related to engineering. Aptitude to apply knowledge concerning: linear algebra, geometry, differential geometry, differential and integral calculus, differential and partial equations, numerical methods, numerical algorithms, statistics and optimization.
Transversal:
2. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.
3. EFFECTIVE USE OF INFORMATION RESOURCES - Level 1. Identifying information needs. Using collections, premises and services that are available for designing and executing simple searches that are suited to the topic.

Teaching methodology

In the lectures the instructor presents some motivating ideas, the fundamental concepts and some relevant developments, intermingled with key examples and the resolution of representative problems.

In the lab classes the students learn how to solve some statistical questions, using R-STUDIO. In the last sessions, several short exercises, to be solved in the lab, will be assigned and graded afterwards.

Learning objectives of the subject

- Be able to use he basic techniques to extract statistical information from a database.
- Be able to use the basic theory of probability
- Be able to use the distribution models that govern random behavior.
- Be able to use the techniques of statistical inference to find, from an observation of the population, certain characteristics of the population as a whole.

340354 - ESTA-C3O43 - Statistics

- Be able to use the regression techniques to make predictions.

Study load

Total learning time: 150h	Hours large group:	45h	30.00%
	Hours medium group:	0h	0.00%
	Hours small group:	15h	10.00%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

340354 - ESTA-C3O43 - Statistics

340354 - ESTA-C3O43 - Statistics

Content

1.Descriptive statistics	Learning time: 1h
	Theory classes: 1h

Description:
1.1 Variables. Types.
1.2 Graphical and statistical tools for analyzing one-dimensional variables.
1.3 Graphic and statistical tools for analyzing two-dimensional variables.

Related activities:
Activity 1

Specific objectives:
Ability to use the basic techniques to extract statistical information from a database.

2: Probability	Learning time: 1h
	Theory classes: 1h

Description:
2.1 Definition of probability
2.2 Conditional probability
2.3 Independence of events

Related activities:
Activity 3
Activity 5

Specific objectives:
Understand the basic theory of probability

340354 - ESTA-C3O43 - Statistics

3: Random variables	Learning time: 1h
	Theory classes: 1h

Description:
 3.1 Definition and types of random variables.
 3.2 Density function and distribution function of random variables.
 3.3 Expectation and variance of a random variable.
 3.4 Distribution models: Binomial, Poisson, Exponential and Normal.

 Related activities:
 Activity 3
 Activity 5

Specific objectives:
 Understand distribution models that govern random behavior.

4. Inference	Learning time: 1h
	Theory classes: 1h

Description:
 4.1 Sampling.
 4.2 Estimation of parameters.
 4.3 Confidence intervals.
 4.4 Hypothesis tests.

 Related activities:
 Activity 2
 Activity 4
 Activity 5

Specific objectives:
 Ability to apply the statistical inference to find, from an observation of the population, certain characteristics of
 the population as a whole.

340354 - ESTA-C3O43 - Statistics

5. Regression	Learning time: 1h
	Theory classes: 1h

Description:
 5.1 Simple linear regression model.
 5.2 Validation of the model.
 5.3 Transformation of variables.

Related activities:
 Activity 4
 Activity 5

Specific objectives:
 Learn regression techniques to make predictions.

340354 - ESTA-C3O43 - Statistics

Planning of activities

---

1. FIRST LAB TEST

Hours: 1h
  Theory classes: 1h

Description:
  The student will have to solve problems, with the help of R-STUDIO, using statistical descriptive techniques of content 1.

Support materials:
  Statement of the test and class material.

Descriptions of the assignments due and their relation to the assessment:
  The written solution of the problems proposed.

Specific objectives:
  Confirm the domain of the descriptive statistical techniques using R.STUDIO

---

2. SECOND LAB TEST

Hours: 2h
  Laboratory classes: 2h

Description:
  The student will have to solve problems, with the help of R.STUDIO, using the techniques of contents 4 and 5.

Support materials:
  Statement of test and class material.

Descriptions of the assignments due and their relation to the assessment:
  The written solution of the proposed problems.

Specific objectives:
  -Be able to use quality control tools and statistical inference using MINITAB.

---

3. FIRST THEORETICAL EXAM

Hours: 2h
  Theory classes: 2h

Description:
  The student will have to solve, in person and in writing, problems on the contents 2 and 3 of probability and random variables.

Support materials:
  Statement of test and summary table of theory

Descriptions of the assignments due and their relation to the assessment:
   The written solution of the proposed exercices

340354 - ESTA-C3O43 - Statistics

Specific objectives:
- Be able to use basic probability theory.
- Be able to use distribution models of aleatory variables.
- Be able to use central limit theorem.

4: SECOND THEORETICAL EXAM	Hours: 2h Theory classes: 2h

Description:
  The student will have to solve, in person and in writing, problems on contents 4 and 5.

Support materials:
  Statement of the test and summary table of theory.

Descriptions of the assignments due and their relation to the assessment:
  The written solution of the proposed problems.

Specific objectives:
- Be able to use statistical inference tools.
- Be able to use linear regression tools.

5: FINAL EXAM	Hours: 2h Theory classes: 2h

Description:
  The student will have to solve, in person and in writing, problems about contents 2, 3, 4 and 5.

Support materials:
  Statement of test and summary table of theory

Descriptions of the assignments due and their relation to the assessment:
  The written solution of the proposed problems.

Specific objectives:
  Be able to use the basic techniques of the subject.

6. RE-EVALUATION TEST	Hours: 2h Theory classes: 2h

Description:
  The student will have to solve, in person and in writing, problems about contents 2, 3, 4 and 5.

340354 - ESTA-C3O43 - Statistics

Support materials:
 Statement of test and summary table of theory

Descriptions of the assignments due and their relation to the assessment:
 The written solution of the proposed problems.

Specific objectives:
 Be able to use the basic techniques of the subject.

Qualification system

A1=laboratory exam with MINITAB
A2=laboratory exam with MINITAB
A3=first partial exam
A4=second partial exam
A5=final exam
A6=re-evaluation test

FINAL GRADE = MAX (0.1*A1+0.1*A2+0.4*A3+0.4*A4, 0.1*A1+0.1*A2+0.8*A5)

(all partial scores on a 0-10 scale)

Regulations for carrying out activities

-The conditions for conducting the individual written tests will be announced with sufficient time.
-It is mandatory to perform at least one of the activities of the laboratory sessions.
-Activities 4 and 5 will be done on the same day and, therefore, only one can be done.
-Only activity 5 can be re-evaluated

340354 - ESTA-C3O43 - Statistics

Bibliography

Basic:

Ras, Antoni. Estadística aplicada per a enginyeria [on line]. Barcelona: UPC, 1993 [Consultation: 22/09/2014]. Available on: <http://hdl.handle.net/2099.3/36689>. ISBN 9788498801170.

Peña, Daniel. Estadística : modelos y métodos. 2a ed. Madrid: Alianza, 1986-1991. ISBN 8420689931.

Complementary:

Ipiña, Santiago L.; Durand, Ana Isabel. Inferencia estadística y análisis de datos. Madrid: Pearson Educación, 2008. ISBN 9788483224045.

Walpole Ronald E. [et al.]. Probabilidad y estadística para ingeniería y ciencias. 9a ed. Mexico: Pearson Educación, 2012. ISBN 9786073214179.

Prat Bartés, Albert [et al.]. Métodos estadísticos: control y mejora de la calidad [on line]. 2a ed. Barclona: Edicions UPC, 2004 [Consultation: 26/07/2019]. Available on: <https://discovery.upc.edu/iii/encore/record/C__Rb1291902?lang=cat>. ISBN 8483017865.