390203 - EST - Statistics

Coordinating unit:	390 - ESAB - Barcelona School of Agricultural Engineering
Teaching unit:	749 - MAT - Department of Mathematics
Academic year:	2019
Degree:	BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AGRICULTURAL, ENVIRONMENTAL AND LANDSCAPE ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AGRICULTURAL ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Teaching unit Compulsory) BACHELOR'S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Teaching unit Compulsory) BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Teaching unit Compulsory)
ECTS credits:	6 Teaching languages: Catalan, Spanish

Teaching staff

Coordinator:	MARTA GINOVART GISBERT
Others:	SONIA PEREZ MANSILLA CLEMENS HUEMER

Degree competences to which the subject contributes

Specific:
  5. Ability to solve mathematic problems in an engineering context . Ability to apply the knowledge of statistics and optimization.
Generical:
  1. Ability to solve problems. LEVEL 2

Teaching methodology

Sessions of one or two hours, mainly made up of lectures, participatory class, problem solving and computer labs.
By means of lectures, structured subjects will be presented with the purpose of providing organized information according to criteria appropriate for the specific objectives.
In the participatory class, there will be time for involvement of students through short activities (direct questions, presentations of specific topics by students, exercises, solving problems related to the theoretical content covered).
The resolution of problems and exercises will be primarily in small groups and in computer laboratories in order to use appropriate computer software. In these sessions, students will be asked to explain how they found solutions to the problems and how they chose the appropriate statistical model for each situation, as well as to implement routines, apply formulas and use statistical software, and interpret the final results.
The autonomous learning will mainly focus on actions aimed at solving problems and doing exercises.
There will be questionnaires for self-assessment and for evaluation of contents through the virtual campus.
Regarding group work, students will carry out a practical project in order to plan a database and use it to apply the topics developed during the course.
There will be a written exam in the middle of the semester and another at the end of the semester.

Learning objectives of the subject

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The Statistics course will follow general training objectives, focusing on building students? skills in learning and promoting attitudes for assessment, suitability and usefulness of models and statistical procedures. Systematic and orderly work, perseverance, in-depth interpretations, accuracy in reasoning, and abstraction will permeate the teaching process. From a general aspect, the student should be able, within the framework of the course, to exercise logical reasoning, develop analytical thinking, implement critical appreciation, argue methodically, interpret rigorously, and to communicate in a well-structured manner.

To take full advantage of the course, students may use descriptive statistics to analyze datasets and inferential statistics to test hypotheses and models, leading statistical tools for problem solving in the area of living systems.

Study load

Total learning time: 150h			
	Hours large group:	40h	26.67%
	Hours medium group:	0h	0.00%
	Hours small group:	20h	13.33%
	Guided activities:	0h	0.00%
	Self study:	90h	60.00%

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Content

DATA ANALYSIS - DESCRIPTIVE STATISTICS DESCRIPTIVA	Learning time: 45h
	Theory classes: 12h Laboratory classes: 6h Self study : 27h

Description:
1.1. Database and statistical software
1.2. Central tendency and variability
1.3. Qualitative variables and quantitative variables
1.4. Graphic representations
1.5. Lineal relationship and non-linear relationship between variables

Related activities:
Activity 1: Lectures
Activity 2: Written exams
Activity 3: Solving problems and exercises Activitat 4: Questionnaires
Activity 5: Final project

FUNDAMENTALS OF STATISTICAL INFERENCE	Learning time: 45h
	Theory classes: 12h Laboratory classes: 6h Self study : 27h

Description:
2.1. Probability
2.2. Random variables
2.3. Normal distribution and other sample distributions: t, x^2 i F
2.4. Point estimation, confidence interval and hypothesis test

Related activities:
Activity 1: Lectures
Activity 2: Written exams
Activity 3: Solving problems and exercises Activitat 4: Questionnaires
Activity 5: Final project

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MODELS AND STATISTICAL METHODS	Learning time: 60h
	Theory classes: 16h Laboratory classes: 8h Self study : 36h

Description:
3.1. Quality control
3.2. Comparison of variables: test t, test F, analysis of variance and multiple comparison of means
3.3. Relationship between quantitative variables: simple linear regression
3.4. Relationship between qualitative variables: contingency tables

Related activities:
Activity 1: Lectures
Activity 2: Written exams
Activity 3: Solving problems and exercises Activitat 4: Questionnaires
Activity 5: Final project

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ACTIVITY 1. LECTURES	Hours: 88h
	  Theory classes: 38h
	  Self study: 50h

ACTIVITY 2. WRITTEN EXAMS	Hours: 2h Theory classes: 2h

Description:
  Individual assessment by written exam in classroom or computer lab. There will be a mid-term test during the semester and a final test at the end of the course which will include all the contents developed during the course. The correction will be carried out by the teacher, and the solutions given to the student.

Support materials:
  Exam sheets, calculator, sheet with formulae, and where appropriate, statistical software.

Descriptions of the assignments due and their relation to the assessment:
  Resolution of the test by the student. Once corrected, the students can check their corrected exams with the teacher during the hours stipulated for the revision.
  The mid-term exam represents 30% of the final mark and the final exam represents 45%.

ACTIVITY 3. SOLVING PROBLEMS AND EXERCISES	Hours: 35h
	  Laboratory classes: 20h
	  Self study: 15h

Description:
  This activity is developed in sessions of two hours, or one hour, either individually or in groups. 20 hours are given in small groups in the computer room, and the rest are in large groups solving problems and exercises. Before the activity in the computer room the students should read the documentation on the activity in order to familiarize themselves with the goals to be achieved.

Support materials:
  Documentation of the activity available in Atenea and/or a printed copy, and statistical software.

Descriptions of the assignments due and their relation to the assessment:
  Students may deliver a report of the activity, and can be evaluated immediately at the end of the activity through a questionnaire, or not directly, through written tests on the subject. In Atenea they will find the answers.

Specific objectives:
  At the end of these activities, students should be able to perform the descriptive analysis of databases, to test hypothesis using specific procedures, and manage statistical models, as well as to use statistical software.

ACTIVITY 4: QUESTIONNAIRES	Hours: 10h Self study: 10h

Description:
  Online activities, either in or out of class to be performed individually.

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Support materials:
   Questionnaires are available in the virtual campus Atenea.

Descriptions of the assignments due and their relation to the assessment:
   This activity represents 15% of the final mark.

Specific objectives:
   At the end of these activities the student should be able to define and calculate descriptive statistics, define the basic concepts related to random variables and statistical inference, and solve various exercises in the field of inferential statistics.

ACTIVITY 5. FINAL PROJECT	Hours: 15h Self study: 15h

Description:
   Preparation, individually or in pairs, of a project to organize a database and obtain information with the statistical analysis of these data.

Support materials:
   Documentation of the activity available in Atenea and/or a printed copy, and statistical software.

Descriptions of the assignments due and their relation to the assessment:
   Delivery of the project following the guidelines established in Atenea.
   With this activity the generic competence is evaluated and represents 10% of the final mark.

Specific objectives:
   At the end of this activity, students should be able to organize databases and introduce them in the computer, to perform descriptive and inferential analysis, and use appropriate statistical software. Also, to solve problems appearing in the context of the subject, individually and in collaboration with others.

Qualification system

There will be several questionnaires throughout the development of the subject (N1).
There will be an assessment exam within the semester (N2), and a final global exam at the end of the semester (N3).
Report (T)

Nfinal = 0,15 N1 + 0,30 N2 + 0,45 N3 + 0,10 T

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Bibliography

Basic:

Moore, D. Estadística aplicada básica. Barcelona: Bosch Editor, 1998. ISBN 8485855809.

Milton, Janet S. Estadística para biología y ciencias de la salud. 2ª ed. Madrid [etc.]: McGraw-Hill. Interamericana, 1994. ISBN 8448600606.

Grima Cintas, Pere; Marco Almagro, Lluís; Tort-Martorell Llabrés, Xavier. Estadística con Minitab : aplicaciones para el control y la mejora de la calidad. Madrid: Garceta, 2011. ISBN 9788492812394.

Daniel, Wayne W. Bioestadística : base para el análisis de las ciencias de la salud. 4a ed. México: Limusa, 2002. ISBN 9681861647.

Complementary:

Campbell, S.K. Equívocos y falacias en la interpretación de estadísticas. Mèxic: Limusa, 1990. ISBN 9681812158.

Montgomery, D.; Runger, G. Probabilidad y estadística aplicadas a la ingeniería. Mèxic: McGraw-Hill, 1996. ISBN 9789681859152.

Rodríguez Muñiz, Luis José; Tomeo Perucha, Venancio; Uña Juárez, Isaías. Métodos estadísticos para ingeniería. Madrid: Garceta, 2011. ISBN 9788492812332.

Webster, Allen L. Estadística aplicada a los negocios y la economía. 3ª ed. Santa Fe de Bogotá [etc.]: Irwin McGraw-Hill, 2000. ISBN 9584100726.

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