

Course guide

390203 - EST - Statistics

Last modified: 16/07/2024

Unit in charge: Barcelona School of Agri-Food and Biosystems Engineering
Teaching unit: 749 - MAT - Department of Mathematics.

Degree: BACHELOR'S DEGREE IN BIOSYSTEMS ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN FOOD ENGINEERING (Syllabus 2009). (Compulsory subject).
BACHELOR'S DEGREE IN AGRONOMIC SCIENCE ENGINEERING (Syllabus 2018). (Compulsory subject).

Academic year: 2024 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Blanco Abellan, Monica

Others: Ginovart, Marta
Huemer, Clemens
López, David
Professor/a encara a determinar

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.

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

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

| Type | Hours | Percentage |
|-------------------|-------|------------|
| Self study | 90,0 | 60.00 |
| Hours large group | 40,0 | 26.67 |
| Hours small group | 20,0 | 13.33 |

Total learning time: 150 h

CONTENTS

DATA ANALYSIS - DESCRIPTIVE STATISTICS DESCRIPTIVA

Description:

- 1.1. Database and statistical software
- 1.2. Numerical summaries of central tendency, variability, position and shape
- 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

Full-or-part-time: 45h

- Theory classes: 12h
Laboratory classes: 6h
Self study : 27h

FUNDAMENTALS OF STATISTICAL INFERENCE

Description:

- 2.1. Probability
- 2.2. Random variables
- 2.3. Normal distribution and other sample distributions: t , χ^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

Full-or-part-time: 45h

- Theory classes: 12h
Laboratory classes: 6h
Self study : 27h

MODELS AND STATISTICAL METHODS

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

Full-or-part-time: 60h

Theory classes: 16h

Laboratory classes: 8h

Self study : 36h

ACTIVITIES

ACTIVITY 1. LECTURES

Full-or-part-time: 88h

Self study: 50h

Theory classes: 38h

ACTIVITY 2. WRITTEN EXAMS

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.

Material:

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

Delivery:

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%.

Full-or-part-time: 2h

Theory classes: 2h

ACTIVITY 3. SOLVING PROBLEMS AND EXERCISES

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.

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.

Material:

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

Delivery:

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.

Full-or-part-time: 35h

Self study: 15h

Laboratory classes: 20h

ACTIVITY 4: QUESTIONNAIRES

Description:

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

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.

Material:

Questionnaires are available in the virtual campus Atenea.

Delivery:

This activity represents 25% of the final mark.

Full-or-part-time: 10h

Self study: 10h

GRADING SYSTEM

There will be several questionnaires throughout or tasks 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).

$$N_{\text{final}} = 0,25 N1 + 0,30 N2 + 0,45 N3$$

BIBLIOGRAPHY

Basic:

- Moore, D. Estadística aplicada básica. Barcelona: Bosch Editor, 1998. ISBN 8485855809.
- Milton, Janet S. Estadística para biología y ciencias de la salud [on line]. 2ª ed. Madrid [etc.]: McGraw-Hill. Interamericana, 1994 [Consultation: 26/07/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=5617. 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.
- Prat Bartés, Albert. Métodos estadísticos : control y mejora de la calidad [on line]. Barcelona: Edicions UPC, 1997 [Consultation: 15/05/2020]. Available on: <http://hdl.handle.net/2099.3/36342>. ISBN 8483012227.
- Diggle, Peter; Chetwynd, Amanda. Statistics and scientific method : an introduction for students and researchers. New York: Oxford University Press, 2011. ISBN 9780199543182.