Course guide
220096 - EST - Statistics

Unit in charge:	Terrassa School of Industrial, Aerospace and Audiovisual Engineering
Teaching unit:	715 - EIO - Department of Statistics and Operations Research.

Degree:	BACHELOR'S DEGREE IN INDUSTRIAL TECHNOLOGY ENGINEERING (Syllabus 2010). (Compulsory subject).

Academic year: 2023   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer:	MARIA ALBAREDA SAMBOLA

Others:	Primer quadrimestre:
	MARIA ALBAREDA SAMBOLA - Grup: 13, Grup: 14
	DANIEL FERNÁNDEZ MARTÍNEZ - Grup: 11, Grup: 12, Grup: 13, Grup: 14
	XAVIER PIULACHS LOZADA BENAVENTE - Grup: 11, Grup: 12
	Segon quadrimestre:
	DANIEL FERNÁNDEZ MARTÍNEZ - Grup: 11, Grup: 12, Grup: 21, Grup: 22
	ALEJANDRO JURADO LEYDA - Grup: 11, Grup: 12
	XAVIER PIULACHS LOZADA BENAVENTE - Grup: 21, Grup: 22

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CE01-INDUS. Ability to solve mathematical problems that may arise in engineering. Aptitude to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimization. (Basic training module)

Generical:
CG8T. THE ABILITY TO ANALYSE AND SYNTHESISE: The ability to think abstractly about the fundamental concepts of a text or exposition and to intelligibly present the result of one's work.

TEACHING METHODOLOGY

Although this course is clearly applicable in professional engineering activities, it is not easy to motivate the students. This problem is due, in part, to the first three topics, which set up the conceptual basis that allow for practical application but, apparently, do not offer "instant results". For this reason, at the beginning of each topic there is an introduction that presents the problem to be addressed, justifying the tools and methods necessary to do so.

The course could be organized around a recommended textbook and all the necessary developments might be done on the board, but since there are concepts that are not easy to assimilate and, it is a course in an Engineering degree, it must be given with the utmost rigor but avoiding the abstract theory. Therefore, all the theoretical lectures (activity 1) are given using multimedia materials specially created by the teachers of the course which give special focus to the most important points and those that are more challenging. These materials are made available to all students in pdf format in the digital platform.

One way to consolidate the learnt concepts is through the development of problems and numerical exercises. For this reason, a collection of problems solved in detail is available for the students. They will know one week in advance the problems that will be discussed in the classroom, so that they can work previously on them and thus participate and a discuss on the concepts and methodology required to deal with each situation. Although every week there is one session of problems (activity 2), theory lessons also include several numerical examples and case studies.

At the end of each topic of the syllabus, a collection of problems, exercises and theoretical questions is made available in Atenea. These exercises must be used for self-assessment (activity 3). These exercises will not be solved in class and their detailed solution will not be given; only the numerical results will be published. Doubts that arise solving these problems, consulting the literature provided in this guide or the course notes, will be solved by the professors during attention hours.
In addition, since this course has a strong computing component, the student will learn to use computers to solve problems. Despite there exists a large amount of statistical software it is not always available to all companies. In this course, by the completion of a project (activity 4), the student learns how to resolve a number of statistical problems that he/she may face using a simple spreadsheet and and the required statistical concepts.
Observation: This course might be taught in Spanish, if needed.

LEARNING OBJECTIVES OF THE SUBJECT

The aim of the course is to train future graduates to verify compliance with the quality standards of products and processes, selecting suppliers, comparing the results of different processes or machines, know what factors control the process, quantify their influence on the optimization of the product, energy saving, pollution or resource efficiency, and estimate the reliability of components or equipment in front of a particular task. That is, make decisions under uncertainties.

STUDY LOAD

Type	Hours	Percentage
Hours medium group	14,0	9.33
Hours large group	46,0	30.67
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

1. Introduction

Description:
.

Full-or-part-time: 10h
Theory classes: 1h
Self study : 9h

2. Probability distributions

Full-or-part-time: 44h
Theory classes: 15h
Practical classes: 5h
Self study : 24h

3. Statistical Sampling

Full-or-part-time: 22h
Theory classes: 6h
Practical classes: 2h
Self study : 14h

4. Statistical Inference

Description:
.

Full-or-part-time: 42h
Theory classes: 12h
Practical classes: 5h
Self study : 25h

5. Regression models

Description:
.

Full-or-part-time: 19h
Theory classes: 6h
Practical classes: 1h
Self study : 12h

6. Reliability

Full-or-part-time: 13h
Theory classes: 6h
Practical classes: 1h
Self study : 6h

ACTIVITIES

1. THEORY LESSONS

Full-or-part-time: 77h
Theory classes: 42h
Self study: 35h

2. PROBLEM LESSONS

Full-or-part-time: 29h
Practical classes: 14h
Self study: 15h

3. SELF ASSESSMENTS

Related competencies :
08 CAS N2. THE ABILITY TO ANALYSE AND SYNTHESISE: The ability to think abstractly about the fundamental concepts of a text or exposition and to intelligibly present the result of one's work.
CE01-INDUS. Ability to solve mathematical problems that may arise in engineering. Aptitude to apply knowledge of linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial differential equations; numerical methods; numerical algorithms; statistics and optimization. (Basic training module)

Full-or-part-time: 18h
Self study: 18h

4. DATA EXPLORATORY ANALYSIS PRACTICE

Full-or-part-time: 9h
Self study: 9h

5. CONTINUOUS ASSESSMENT WITH QUESTIONNAIRE

Full-or-part-time: 2h
Self study: 2h

6. PARTIAL EXAM

Full-or-part-time: 7h
Theory classes: 1h 30m
Self study: 5h 30m

7. FINAL EXAM

Full-or-part-time: 8h
Theory classes: 2h 30m
Self study: 5h 30m

GRADING SYSTEM

The final grade depends on 4 evaluations:
· Activity 4 (project), with a weight of 10%
· Activity 5 (quizzes) with a weight of 10%
· Activity 6 (partial exam) with a weight of 40%
· Activity 7 (final exam) with a weight of 40%

Any student who cannot attend to the midterm exam (activity 6) or that wants to improve the obtained grade, will have the opportunity to improve that grade by taking an additional written exam that will take place the same day as the final exam (activity 7). The grade obtained in this test will range between 0 and 10, and will replace that of the midterm exam in case it is higher.

EXAMINATION RULES.

Anyone that does not attend to any of the evaluative activities will be graded with a 0 if he/she has attended any other one.

BIBLIOGRAPHY

Basic:
- Walpole, Ronald E. [et al.]. Probabilidad y estadística para ingeniería y ciencias [on line]. 9a ed. México: Pearson, 2012 [Consultation: 26/09/2022]. Available on: https://www-ingebook-com.recursos.biblioteca.upc.edu/ib/NPcd/IB_BooksVis?cod_primaria=1000187&codigo_libro=6766.
- Ipiña, Santiago L. Inferencia estadística y análisis de datos. Madrid: Perason Educación, 2008. ISBN 9788483224045.
- Montgomery, Douglas C. Probabilidad y estadística aplicadas a la ingeniería. 2a ed. México: Limusa, 2002. ISBN 9789681859152.

Complementary:
- Rohatgi, V.K. Statistical inference. New York: John Wiley, 1984. ISBN 9780486428123.
- Lawless, Jerald F. Statistical models and methods for lifetime data. 2a ed. Hoboken: Wiley-Interscience, 2003. ISBN 0471372153.

RESOURCES

Hyperlink:
- http://aprenestadistica.gencat.cat/secundaria/activitats/common/glossari_estadistic.jsp

Other resources:
Material made available through Atenea (in catalan)