Statistics

Academic Year: (2023 / 2024) **Review date: 10-05-2023**

Department assigned to the subject: Statistics Department

Coordinating teacher: MINGUEZ SOLANA, ROBERTO

Type: Basic Core ECTS Credits : 6.0

Year : 1 Semester : 2

Branch of knowledge: Social Sciences and Law

REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Linear algebra
Calculus
Programming

SKILLS AND LEARNING OUTCOMES

CB1. Students have demonstrated possession and understanding of knowledge in an area of study that builds on the foundation of general secondary education, and is usually at a level that, while relying on advanced textbooks, also includes some aspects that involve knowledge from the cutting edge of their field of study
CB2. Students are able to apply their knowledge to their work or vocation in a professional manner and possess the competences usually demonstrated through the development and defence of arguments and problem solving within their field of study.
CG1. Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
CG11. Ability to solve mathematical problems that may arise in engineering. Ability to apply knowledge of: linear algebra; geometry; differential geometry; differential and integral calculus; differential and partial derivative equations; numerical methods; numerical algorithms; statistics and optimisation.
RA1. Knowledge and understanding: Have basic knowledge and understanding of science, mathematics and engineering within the industrial field, as well as knowledge and understanding of Mechanics, Solid and Structural Mechanics, Thermal Engineering, Fluid Mechanics, Production Systems, Electronics and Automation, Industrial Organisation and Electrical Engineering.
RA2. Engineering Analysis: To be able to identify engineering problems within the industrial field, recognise specifications, establish different resolution methods and select the most appropriate one for their solution
RA3. Engineering Design: To be able to design industrial products that comply with the required specifications, collaborating with professionals in related technologies within multidisciplinary teams.
RA5. Engineering Applications: To be able to apply their knowledge and understanding to solve problems and design devices or processes in the field of industrial engineering in accordance with criteria of cost, quality, safety, efficiency and respect for the environment.

OBJECTIVES

By the end of this course, students will be able to have:
1. Knowledge and understanding of the statistic principles underlying their branch of engineering
2. The ability to apply their knowledge and understanding to identify, formulate and solve statistic problems using established methods
3. The ability to apply their knowledge and understanding to analyse engineering products, processes and methods
4. An understanding of statistics methodologies, and an ability to use them
5. The ability to select and use appropriate statistic tools and methods
6. The ability to combine theory and practice to solve engineering problems
7. An understanding of applicable statistic techniques and methods, and of their limitations

DESCRIPTION OF CONTENTS: PROGRAMME

1. Descriptive statistics
1.1. Qualitative data vs quantitative data
1.2. Descriptive statistics for one variable
1.3. Descriptive statistics for two variables
2. Probability

2.1. Introduction to probability
2.2. Events and operations with events
2.3. Definition and properties of probability
2.4. Conditional probability and independence
2.5. The law of total probability
2.6. Bayes' theorem
3. Random variables
3.1. Concept of random variable
3.2. Discrete random variables
3.3. Continuous random variables
3.4. Characteristic measures of a random Variable
3.5. Independence of random variables
4. Distribution models
4.1. Binomial
4.2. Geometric
4.3. Poisson
4.4. Uniform (continuous)
4.5. Exponential
4.6. Normal (CLT)
5. Statistical inference
5.1. Introduction
5.2. Estimators and their sampling distributions
5.3. Confidence intervals
5.4. Hypothesis testing
6. Quality control
6.1. Introduction to quality control
6.2. Control charts for variables
6.3. Control charts for attributes
7. Linear regression
7.1. Introduction
7.2. Simple linear regression
7.3. Multiple linear regression

LEARNING ACTIVITIES AND METHODOLOGY

- Lectures: 2,2 ECTS
- Problem solving sessions: 1,8 ECTS
- Computes sessions: 1 ECTS
- Evaluation sessions (continuous evaluation and final exam): 1 ECTS

ASSESSMENT SYSTEM

The course will be evaluated through continuous assessment and a final exam, with the following weighting:
50% - Final exam.
50% - Continuous assessment.
There is no minimum grade required in either of these two parts.

Continuous assessment (50%):
The subject will be continuously assessed through the completion of two partial tests (20%+25%). The remaining 5% corresponds to the grade of the exercises in the SPOC.

Final exam - ordinary call:
The final exam will consist of solving problems using all the tools learned during the course. The evaluation system for the ordinary call will be 50% grade from continuous assessment + 50% grade from the final exam.

Final exam - extraordinary call:
The final exam will consist of solving problems using all the tools learned during the course. The evaluation system for the extraordinary call will be the highest between the following criteria:
a) 100% grade from the final exam.
b) 50% grade from continuous assessment + 50% grade from the final exam.

% end-of-term-examination:	50
% of continuous assessment (assigments, laboratory, practicals…):	50

BASIC BIBLIOGRAPHY

- MONTGOMERY, D.C., RUNGER, G.C Applied Statistics and Probability for Engineers, John Wiley & Sons, 2003
- NAVIDI, W Statistics for Engineers and Scientists, McGraw-Hill, 2006
- SONG, TT Fundamentals of Probability and Statistics for Engineers, John Wiley & Sons, 2004
- WASSERMAN, L All of Statistics, Springer-Verlag, 2004

ADDITIONAL BIBLIOGRAPHY

- GUTTMAN, L., WILKS, S.S., HUNTER, J.S Introductory Engineering Statistics, Wiley, 1992