

## SUBJECT TEACHING GUIDE

### G1503 - Uncertainty Analysis in Engineering

First Degree in Civil Engineering

Degree in Civil Engineering

BILINGUAL UC-CU CIVIL ENGINEERING PROGRAM

Academic year 2022-2023

1. IDENTIFYING DATA			
Degree	First Degree in Civil Engineering Degree in Civil Engineering	Type and Year	Core. Year 1 Compulsory. Year 1
Faculty	School of civil Engineering		
Discipline	Obligatory Subjects  BASIC MATHEMATICS FOR ENGINEERING		
Course unit title and code	G1503 - Uncertainty Analysis in Engineering		
Number of ECTS credits allocated	6	Term	Semester based (2)
Web	<a href="https://moodle.unican.es">https://moodle.unican.es</a>		
Language of instruction	English	Mode of delivery	Face-to-face

Department	DPTO. MATEMATICA APLICADA Y CIENCIAS DE LA COMPUTACION
Name of lecturer	MARIA DOLORES FRIAS DOMINGUEZ
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Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 1. DESPACHO PROFESORES (1046)
Other lecturers	

### 3.1 LEARNING OUTCOMES

- Ability to analyze data using one and two-dimensional methods of Descriptive Statistics.
- Capacity to solve problems that require using probability models and probability distributions for discrete and continuous random variables.
- Model extreme events selecting the most appropriate approach.
- Ability to apply statistical inference methods to obtain point and confidence interval estimators of parameters, and to test hypotheses.
- Develop computer skills to the practice of statistics in engineering.

#### 4. OBJECTIVES

The overall objective of the subject is the acquisition by the student of a way of thinking that will allow him to approach practical problems in a logical and systematic way from the statistical knowledge and tools learned.

Introduce the student to basic statistical methods and procedures that allow him to summarize information from a large amount of data, characterize variability, or quantify chance.

Instill in our students a proper use of statistical software to solve scientific problems in engineering.

#### 6. COURSE ORGANIZATION

CONTENTS	
1	Part I
2	Lesson 1. One-dimensional and two-dimensional Descriptive Statistics: Tables, statistics and graphics.
3	Lesson 2. Probability: Probability and properties, conditional probability and Bayes theorem.
4	Part II
5	Lesson 3. Random variables: Discrete and continuous random variables. Probability mass and density function and cumulative distribution function.
6	Lesson 4. Common probability distributions: Most discrete and continuous common probability distributions. Approximation to the Normal distribution.
7	Part III
8	Lesson 5. Statistics of extremes: Order statistics, Exact and asymptotic distributions of order statistics. Excedences.
9	Lesson 6. Probabilistic paper: Probabilistic paper concepts. Some probabilistic papers (Normal, Log-Normal and extreme probability paper)
10	Part IV:
11	Lesson 7. Inference: Introduction. Point and interval estimation. Inference of proportion, mean and variance.
12	Lesson 8. Hypothesis testing: Introduction. Hypothesis testing of proportion, mean and variance.

## 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Writing exam Part I	Written exam	No	Yes	17,00
Writing exam Part II	Written exam	No	Yes	18,00
Writing exam Part III	Written exam	No	Yes	15,00
Writing exam Part IV	Written exam	Yes	Yes	15,00
Practical exams	Laboratory evaluation	No	No	20,00
Seminars and other activities.	Others	No	No	15,00
TOTAL				100,00
Observations				
<p>The subject is taught and assessed in English only.</p> <p>In the repeat exam period, students are only allow to repeat failed exams.</p> <p>Marks obtained along the year will be valid until the extra call.</p> <p>The final mark for the repeat exam period will be the weighted average of the different evaluation methodologies indicated in this guide.</p> <p>The sum of the resulting marks from the writing exams should be more than 25% of the total mark of the subject to pass the subject.</p>				
Observations for part-time students				
<p>The subject is taught and assessed in English only.</p> <p>The subject can be followed from Moodle.</p> <p>If required at the beginning of the term, part-time students can do writing exams together the day fixed for the final exam.</p> <p>Practical exams will take place as for the rest of the students to ensure the same evaluation of knowledge and competence.</p> <p>Works and seminars proposed along the course can be done individually and submitted electronically .</p>				

## 8. BIBLIOGRAPHY AND TEACHING MATERIALS

### BASIC

Devore, J.L. 2012. "Probability and statistics for engineering and the sciences". Canada: Brooks-Cole Cengage Learning.  
ISBN: 978-0-8400-6827-9.  
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=336954>

Cohen, Y.; Cohen, J.Y. 2008. "Statistics and data with R: an applied approach through examples". Chichester:: John Wiley & Sons. ISBN: 978-0-470-75805-2.  
<http://catalogo.unican.es/cgi-bin/abnetopac/?TITN=292113>