COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject

Subject name	Estadística y Probabilidad/Statistics and Probability
Subject code	E000013558
Mainprogram	Grado en Análisis de Negocios / Business Analytics por la Universidad Pontificia Comillas
Involved programs	Grado en Análisis de Negocios/Bachelor in Business Analytics y Grado en Relaciones Internacionales [Second year] Grado en Análisis de Negocios/Bachelor in Business Analytics y Grado en Derecho [Second year] Grado en Análisis de Negocios/Bachelor in Business Analytics [Second year] Grado en Admin. y Dirección de Emp. y Grado en Análisis de Negocios/Bachelor in Business Analytics [Second year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Departamento de Métodos Cuantitativos
Coordinator	Jose Luis Arroyo Barrigüete
Schedule	Se comunicará en los primeros días de clase
Office hours	Solicitud previa
Course overview	The first part of the course is dedicated to reviewing the concepts and techniques that allow describing and summarizing a set of data from a univariate and bivariate point of view. Some of the topics covered are frequency tables, graphs, measures of central tendency, dispersion, position, concentration, contingency tables and measures of association and correlation, among others. The second part deals with the basic concepts of probability and the modeling of random phenomena. It deals with the different conceptions of probability, the Bayes' theorem, discrete and continuous random variables, and some frequently used probability models, such as the Binomial, Poisson or Gaussian, among others.

Teacher Information

Teacher

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

Subject of an instrumental nature dedicated mainly to statistical techniques that allow to describe and summarize a data set from a singlevariant and bivariant point of view. It develops topics necessary to address the information available, in such a way as to achieve a better understanding and knowledge of the behavior of the random and deterministic phenomena present in the making of business decisions in the different areas of the company (economy, finance, marketing, Human Resources), in which knowledge of reality and decisions on issues covered in them are characterized by the existence of uncertainty.

Prerequisites

The use of previously studied mathematical concepts is required.

Competencies - Objectives

Competences

Learning outcomes

CN7	Resultados del proceso de formación y de aprendizaje. CN7. Conoce los fundamentos y las herramientas necesarias para el análisis de datos, desde el preprocesamiento y análisis estadístico hasta las técnicas más avanzadas, incluyendo modelos de aprendizaje supervisado y no supervisado.

HA7	Resultados del proceso de formación y de aprendizaje. HA7. Utiliza adecuadamente herramientas de análisis y visualización de datos, incluyendo software específico y lenguajes de programación
CM8	Resultados del proceso de formación y de aprendizaje. CM8. Identifica y selecciona la técnica o técnicas de análisis de datos más adecuada a cada problema, la implementa, interpreta adecuadamente los resultados y sus limitaciones, y los comunica a un público no técnico.
RA1	Estadística y Probabilidad / Statistics & Probability. RA1. Conocer los fundamentos de las principales medidas y técnicas para describir un conjunto de datos desde un punto de vista univariante y multivariante.
RA2	Estadística y Probabilidad / Statistics & Probability. RA2. Saber seleccionar para cada problema tanto la fuente de datos como la técnica o técnicas de análisis estadístico básico, para poder convertir los datos en bruto en información y ésta en conocimiento que ayude a la toma de decisiones y a mejorar la gestión.
RA3	Estadística y Probabilidad / Statistics & Probability. RA3. Ser capaz de resumir, sintetizar, interpretar y comunicar de una forma atractiva y eficaz los resultados del análisis de datos, de manera que resulten comprensibles a destinatarios técnicos y no técnicos, y ayuden de forma eficiente a la toma de decisiones empresariales.

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

INTRODUCTION

TOPIC 1: BIG DATA

DESCRIPTIVE ANALYSIS

TOPIC 2: INTRODUCTION TO CLASSIC STATISTICS

-Key Definitions

TOPIC 3: DESCRIPTIVE ANALYSIS

- Observation units: Variables and Data
- Presentation of the data: Frequency distributions and Graphical Representations.
- Relations between two variables: Scatter Charts and Contingency Tables

TOPIC 4: MEASURES: STATISTICS

- Measures of Central Tendency: Mode, Medium and Mean
- Position Measures: Quartiles, Deciles and Percentiles
- Variability Measures: Range, Variance, Typical Deviation, Variation Coefficient
- Standardization
- Measures of Form and Concentration: Gini and Lorenz Curve Index
- Relationship between two variables: Dependency / Independence Analysis, Correlation

PROBABILITY

TOPIC 5: UNCERTAINTY AND ITS MEASUREMENT

- Random Phenomena: Concepts

- Operations with Events
- Probability: different conceptions
- Probability Rules
- Rectification of Probability: Bayes Theorem

TOPIC 6: RANDOM VARIABLE

- Random Variable Concept
- Discrete Random Variables: Quantum Function and Distribution Function
- Continuous Random Variables: Density Function and Distribution Function
- Expected Value, Variance and Standard Deviation: Properties
- Probability Distribution Models:

  Discrete: Binomial, Poisson.

  Continuous: Uniform, Normal.

TEACHING METHODOLOGY

General methodological aspects of the subject

The use of ChatGPT or other Generative Artificial Intelligence in any evaluation activity not explicitly authorized by the teacher will be considered a serious offense under the General Regulations of the University, art. 168.2.e: "carrying out actions aimed at falsifying or defrauding the academic performance evaluation systems". The consequences of this will be "temporary expulsion of up to three months or with the prohibition to sit the exam in the next session following the imposition of the sanction, in one or more subjects in which the student is enrolled. The first-time commission of the actions specified in section 2(e) of this same article, in addition to resulting in a failing grade (0) in the respective subject, will also be sanctioned with the prohibition to sit the exam for that subject in the next session,".

In other words, the use of ChatGPT or other Generative Artificial Intelligence is prohibited for any evaluation activity in which the teacher has not explicitly indicated that it can be used.

In-class Methodology: Activities

Lessons of an expository nature.

Exercises and problem solving

Sessions dedicated to the management of the R Studio computer programs and their subsequent use for the resolution of business problems.

Non-Presential Methodology: Activities

Individual and / or group study, and organized reading.

Troubleshooting both using computer programs and not.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS		
Lecciones de carácter expositivo	Ejercicios y resolución de casos y de problemas	Pruebas de evaluación
35.00	21.00	4.00
NON-PRESENTIAL HOURS		
Ejercicios y resolución de casos y de problemas	Estudio y lectura organizada	
30.00	60.00	
ECTS CREDITS: 6,0 (150,00 hours)		

EVALUATION AND CRITERIA

The use of AI to produce full assignments or substantial parts thereof, without proper citation of the source or tool used, or without explicit permission in the assignment instructions, will be considered plagiarism and therefore subject to the University's General Regulations.

Evaluation activities	Evaluation criteria	Weight
FINAL EXAM	It will include both theory/problems and R programming. To carry out the weighted average between the final exam grade and the partial exams, it is necessary to have achieved at least score 4,5 on the Final Exam.	60 %
Midterm Exam	Midterm Exam (35%): It covers Topics 1 to 5 (both included) and Practical Sessions 1 to 4. This exam will include R programming, as well as theoretical/practical questions. NOTE: Attending the corresponding practical sessions is a mandatory requirement to take Midterm 1. Failure to attend will result in a grade of zero for this exam. In the case of justified absence from the midterm exam, its weight will be transferred to the final exam. No make-up midterms will be administered. Final grades will also consider class attendance and active participation as part of continuous assessment. Additionally, extra points may be awarded for completing activities proposed by the instructor.	35 %
Group project developed entirely using Artificial Intelligence Generative	A group project will be carried out, developed entirely using Artificial Intelligence Generative (AIG), and more specifically, with a Large Language Model (LLM).	5 %

Ratings

EXTRAORDINARY CALL

It will be considered the best of the following two options:

1. Use the same criteria as in the ordinary call.
2. Only consider 100% of the extraordinary exam grade.

REPEATER AND EXCHANGE STUDENTS

Student who repeats the course and has the pending subject: the final grade will be obtained following the above criteria.

Student who passes the course and has the pending subject: the final grade will correspond to that of the written exam.

In third and subsequent calls the final grade will correspond to the final exam.

Exchange students (IN): same system as for regular students.

Exchange students (OUT): same system as for third and subsequent calls.

Final Exam

Final exam (60%). A final exam of the subject will be carried out, the content of which corresponds to the entire program (including R programming)

Partial Exams

Midterm Exam (35%): It covers Topics 1 to 5 (both included) and Practical Sessions 1 to 4. This exam will include R programming, as well as theoretical/practical questions. **NOTE**: Attending the corresponding practical sessions is a mandatory requirement to take Midterm 1. Failure to attend will result in a grade of zero for this exam.

Group project

A group project (5%) will be carried out, developed entirely using Artificial Intelligence Generative (AIG), and more specifically, with a Large Language Model (LLM).

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Midterm exam	10th week of the course aprox.	
Group project	12th week of the course aprox.	

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

Borrás Pala, F., Martinez de Ibarreta Zorita, C., Escobar Torres, L. Estadística Empresarial en 101 ejemplos (volumen I) EV Services 2019.

Borrás Pala, F., Martinez de Ibarreta Zorita, C., Escobar Torres, L. Estadística Empresarial en 101 ejemplos (volumen II) EV Services 2019.

Youtube channel for the subject: https://www.youtube.com/playlist?list=PL5_Uyo65b_AZvWFM4zfJ8DkqedOeZNxxv

Ortiz Lozano, J. M. (2024) Practicas de estadística con R y Rcommander en el ámbito del Business Analytics. PONTIFICIA COMILLAS

Complementary Bibliography

Martín Pliego, J., Ruiz-Maya Pérez, L. 2001 Estadística Descriptiva. S.A. Alfa Centauro. Madrid

Martín Pliego, J., Ruiz-Maya Pérez, L. 2001 Estadística I: Teoría de la Probabilidad. S.A. Alfa Centauro. Madrid

Mª Josefa Peralta, Antonio Rua Vieites, Raquel Redondo Palomo. 2017. Estadística: problemas resueltos. Ediciones Pirámide.