



## FICHA TÉCNICA DE LA ASIGNATURA

Datos de la asignatura	
Subject name	Statistics and Probability
Subject code	E000008135
Main program	<a href="#">Grado en Análisis de Negocios/Business Analytics</a>
Involved programs	Grado en Análisis de Negocios/Business Analytics y Grado en Relaciones Internacionales [Second year] Grado en Análisis de Negocios/Business Analytics y Grado en Derecho [Third year] Grado en Administración y Dirección de Empresas y Grado en Análisis de Negocios/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	You will be in touch in the first days of school
Office hours	Pre-application
Course overview	The first part of the subject is dedicated to reviewing the concepts and techniques that allow to describe and summarize a dataset from a single-variant and bivariate point of view. Some of the topics covered are: frequency tables, charts, central trend measures, dispersion, position, concentration, contingency tables and measures of association and correlation, among others. The second part discusses the basic concepts about probability and modelling of random phenomena. Thus, they address among other aspects, the different conceptions of probability, the rectification of probability through the Bayes theorem, discrete and continuous random variables, and some frequently used probability models, such as Binomial law, Poisson's or Normal Law, among others. Finally, Index numbers will be studied.

Datos del profesorado	
<b>Teacher</b>	
Name	Antonio Rúa Vieites
Department	Departamento de Métodos Cuantitativos
Office	Alberto Aguilera 23 [OD-401]
E-Mail	rvieites@icade.comillas.edu
Phone	2290
<b>Teacher</b>	
Name	Eduardo César Garrido Merchán
Department	Departamento de Métodos Cuantitativos
E-Mail	ecgarrido@icade.comillas.edu
<b>Teacher</b>	



Name	José Luis Arroyo Barrigüete
Department	Departamento de Métodos Cuantitativos
Office	Alberto Aguilera 23
EMail	jlarroyo@icade.comillas.edu
Phone	2257

## DATOS ESPECÍFICOS DE LA ASIGNATURA

### Contextualización de la asignatura

#### Aportación al perfil profesional de la titulación

Subject of an instrumental nature dedicated mainly to statistical techniques that allow to describe and summarize a data set from a single-variant and bivariate 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.

#### Prerrequisitos

The use of previously studied mathematical concepts is required.

### Competencias - Objetivos

#### Competencias

##### GENERALES

<b>CG02</b>	Capacidad de análisis de datos masivos procedentes de diversas fuentes: texto, audio, numérica e imagen	
	<b>RA1</b>	Conocer las diferentes fuentes de datos tanto estructurados como no estructurados, internos o externos a la empresa, provenientes de fuentes digitales o no relevantes para el análisis y la gestión empresarial ¿basada en datos"(data driven)
	<b>RA2</b>	Conocer alguno de los procedimientos para integrar información procedente de diferentes fuentes de datos y de datos de diferente categoría (estructurados (datos numéricos) y no estructurados (texto, conversaciones, audio y video, datos de geolocalización, información de sensores¿).
<b>CG03</b>	Resolución de problemas y toma de decisiones en un entorno de datos masivos tanto cuantitativos como cualitativos	
		Saber seleccionar para cada problema la técnica o técnicas de análisis de datos más adecuada para poder



	<b>RA1</b>	convertir los datos ¿en bruto¿ en información y ésta en conocimiento que ayude a la toma de decisiones y a mejorar la gestión.
<b>CG04</b>	Capacidad para elaborar proyectos e informes de manera oral y escrita, difundiendo estas ideas a través de canales digitales	
	<b>RA1</b>	Ser capaz de resumir, sintetizar y comunicar de una forma atractiva y eficaz los resultados de la aplicación de las técnicas de análisis de datos, incluso de las más sofisticadas, de manera que resulten comprensibles a destinatarios no técnicos y ayuden de forma eficiente a la toma de decisiones empresariales.
<b>CG09</b>	Compromiso ético en la sociedad de la información	
	<b>RA1</b>	Persigue la excelencia en las actuaciones profesionales
	<b>RA2</b>	Se preocupa por las consecuencias que su actividad y su conducta pueden tener para los demás
	<b>RA3</b>	Incorpora en su discurso y en sus propuestas de actuaciones, las consecuencias que las mismas pueden tener para los distintos stakeholders de una organización global
<b>ESPECÍFICAS</b>		
<b>CE19</b>	Conocer los fundamentos de las principales técnicas tanto de la estadística clásica (descriptiva e inferencial) como del data mining	
	<b>RA1</b>	Conocer los fundamentos de las principales medidas y técnicas para describir un conjunto de datos desde un punto de vista univariante y bivariante.
<b>CE20</b>	Saber modelizar un problema empresarial real que precise análisis de datos y seleccionar críticamente la técnica o combinación de técnicas más adecuada	
<b>CE21</b>	Saber interpretar, evaluar y comunicar resultados derivados de las técnicas de análisis de datos así como usarlos para la ayuda en la gestión y la toma de decisiones empresariales	
<b>CE22</b>	Saber aplicar las técnicas de análisis de datos (tanto las de la estadística clásica como las técnicas de data mining) a un conjunto de datos reales, mediante el empleo de algún software apropiado para tal fin	
	<b>RA1</b>	Saber realizar un análisis descriptivo básico a un conjunto de datos reales usando software apropiado para tal fin

## BLOQUES TEMÁTICOS Y CONTENIDOS

### Contenidos – Bloques Temáticos

#### INTRODUCTION

#### TEMA 1: BIG DATA

- Introduction to 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.

## INDEX NUMBERS

### TOPIC 7: INDEX NUMBERS

- Simple and Compound Indices

- Indices of LASPEYRES, PAASCHE and FISHER

- Properties of index numbers

- Change of base

- Deflation

## METODOLOGÍA DOCENTE

### Aspectos metodológicos generales de la asignatura

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 for up to three months or prohibition from taking the exam in the next call after the sanction is imposed, in one or several subjects in which the student is enrolled, [...] apart from implying a failing grade (0) in the respective subject".

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.

### Metodología Presencial: Actividades

- 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

CG02, CG03, CG04, CE19,  
CE20, CE21, CE22



resolution of business problems

### Metodología No presencial: Actividades

- Individual and / or group study, and organized reading.

CG02, CG03, CG04, CE20,  
CE22

- Troubleshooting both using computer programs and not.

### RESUMEN HORAS DE TRABAJO DEL ALUMNO

CLASSROOM HOURS	
Lecciones de Carácter expositivo	Ejercicios y resolución de casos y de problemas
35.00	25.00
NON-PRESENTIAL HOURS	
Ejercicios y resolución de casos y de problemas	Estudios individual y/o en grupo, y lectura organizada
30.00	60.00
<b>ECTS CREDITS: 6,0 (150,00 hours)</b>	

### EVALUACIÓN Y CRITERIOS DE CALIFICACIÓN

Evaluation activities	Evaluation criteria	Weight
A final exam of the subject will be carried out, the content of which corresponds to the entire program.	<ul style="list-style-type: none"> <li>- Understand the fundamentals of the main techniques of descriptive statistics and probability theory by applying them to problem solving and decision making in a massive data environment.</li> <li>- Knows how to apply the techniques of descriptive statistics to a set of real data by using the appropriate software for this purpose.</li> <li>- Interpret, evaluate and logically communicate the results obtained from the application of statistical techniques in data analysis.</li> </ul>	55
Test 1: Topics 1 to 4, including practice with R	<ul style="list-style-type: none"> <li>-Understands the fundamentals of the main techniques of descriptive statistics by applying them to problem solving and decision making in massive data environment.</li> <li>- Knows how to apply the techniques of descriptive descriptive to a set of real data using the appropriate software for this purpose.</li> <li>- Interprets and evaluates logically the results obtained from the application of statistical techniques</li> </ul>	20
	<ul style="list-style-type: none"> <li>- Understands the fundamentals of probability by</li> </ul>	



Test 2: Topics 5 and 6, including practice with R	applying them to problem solving and decision making in a massive data environment. - Logically interprets and evaluates the results obtained from the application of statistical techniques in data analysis.	25
---	---	----

## Calificaciones

FINAL SCORE

### CONVOCATORIA ORDINARIA

FINAL EXAM: 55%. It will include both theory/problems and R programming.

WRITTEN TESTS: 45%

- Test 1 (20%): The first test at the end of topic 4. It includes topics 1 to 4, both included, and practices 1 to 4.  
NOTE: It will be a prerequisite to take test 1 to have attended the corresponding practical sessions. Failure to do so will result in a grade of zero.
- Test 2: (25%) Includes topics 5 and 6, and practices 5 and 6.  
NOTE: It will be a prerequisite to take test 2 to have attended the corresponding practical sessions. Failure to do so will result in a grade of zero.

FINAL CONSIDERATIONS:

The absence for justified cause to any of the partial tests will cause the weight of such test to pass to the final exam. No partial tests will be repeated.

To carry out the weighted average between the final grade and the tests, it is necessary to have achieved at least score 4,5 on the Final Exam.

In the final qualification, assistance and active participation will also be taken into account in the continuous evaluation.

### CONVOCATORIA EXTRAORDINARIA

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 STUDENTS OF THE SUBJECT:

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.



## PLAN DE TRABAJO Y CRONOGRAMA

Activities	Date of realization	Delivery date
1st Test. Theory and "R": topics 1, 2, 3 y 4	8th week of the course	8th week of the course
2nd Test. Theory and R: topics 5 and 6	12h week of the course	12th week of the course

## BIBLIOGRAFÍA Y RECURSOS

### Bibliografía Básica

- Borrás Pala, F., Martínez de Ibarreta Zorita, C., Escobar Torres, L. Estadística Empresarial en 101 ejemplos (volumen I) EV Services 2019.
- Borrás Pala, F., Martínez de Ibarreta Zorita, C., Escobar Torres, L. Estadística Empresarial en 101 ejemplos (volumen II) EV Services 2019.
- YouTube channel: [https://www.youtube.com/playlist?list=PL5\\_Uyo65b\\_AZvWFM4zfJ8DkqedOeZNxxv](https://www.youtube.com/playlist?list=PL5_Uyo65b_AZvWFM4zfJ8DkqedOeZNxxv)
- Newbold, P., Carlson, W. L., Thorne, B. 2013. *Estadística para Administración y Economía*. Pearson Prentice Hall. Madrid
- Sarabia, J.M., Prieto, F., Jordá, V. 2018. *Prácticas de estadística con R*. Pirámide. Madrid

### Materiales dedicados a la preparación de la asignatura (Dpto. de Métodos Cuantitativos)

- Materials dedicated to the preparation of the subject (Moodle Rooms)

### Bibliografía Complementaria

- 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
- M<sup>a</sup> Josefa Peralta, Antonio Rua Vieites, Raquel Redondo Palomo. 2017. *Estadística: problemas resueltos*. Ediciones Pirámide.

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data [that you have accepted on your registration form](#) by entering this website and clicking on "download"

[https://servicios.upcomillas.es/sedelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792](https://servicios.upcomillas.es/sedeelectronica/inicio.aspx?csv=02E4557CAA66F4A81663AD10CED66792)