COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject

Subject name	Optional Complementary: Advanced Data Analytics for Fusiness
Subject code	E000011607
Mainprogram	Official Master's Degree in Business Administration - MBA
Involved programs	Máster Universitario en Administración de Empresas (MBA) [First year]
Credits	3,0 ECTS
Type	Optativa
Department	Departamento de Métodos Cuantitativos
Coordinator	Mercedes Barrachina Fernández (mlmbarrachina@icade.comillas.edu)
Office hours	upon request
Course overview	Students will acquire a deeper understanding of the core concepts and technologies used to extract information from data by delving into their characteristics, benefits, and disadvantages.

Teacher Information

Teacher

Name	María de las Mercedes Barrachina Fernández
Department	Departamento de Métodos Cuantitativos
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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

This course introduces the participants to the rapidly evolving Data Science ecosystem and its multiple applications in numerous business settings. As data is reshaping the business environment, executives must identify, evaluate, and face new challenges. These unprecedented opportunities led to the emergence of new products and business models and the revision of traditional ones.

Students will acquire a **deeper understanding of the core concepts and technologies used to extract information from data** by delving into their characteristics, benefits, and disadvantages.

This course also **bridges the gap between the managerial and technical standpoints** by offering a hands-on approach and exposure to technical matters. Upon conclusion, participants will be ready to **propose business solutions supported by data** and **communicate efficiently with technical staff**.

Course objectives

- Understand the importance and value of data.
- Understand the people, processes, and technologies involved in extracting knowledge from data.

- Propose data-driven solutions.
- Manage and communicate efficiently with technical teams.
- Demystify technical topics.

Prerequisites

- Attending the course "Data and Information" is recommended.
- Even though no programming skills are required, a predisposition towards technical matters is expected due to the hands-on nature of the subject.

Competencies - Objectives

Competences

GENERALES	
CG01	Analytic and synthesis cognitive capacities applied to business situations and managing and organisation problems.
CG02	Management of data and information as key elements for decision-making and for identification, formulation and resolution of business problems.
CG03	Problem-solving and decision-making skills at a strategic, tactic and operational level with regard to a business, considering the interrelationship between the different functional and business areas.
CG09	Knowledge, understanding and handling of tools for diagnosis of the competitive position of a company, and designing and executing the company's strategic plan.
ESPECÍFICAS	
CE09	Being able to analyse the problems of the company and its environment through the understanding of data and information – their nature, collection, storage, modelling and extraction – and through the use of quantitative methods, and to identify appropriate analysis and modelling techniques and apply these same techniques to predictive and simulation case studies of business management.

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Introduction to Machine Learning:

- Learning types: supervised, unsupervised, reinforced, deep.
- Tools: preprocessing, dimensionality reduction, model selection, classification, regression, clustering, others.
- Generalization: Underfitting/overfitting.
- Training/test split. Cross validation. Regularization.

Workshop: Introduction to R and Python

Basic concepts of statistics: hypothesis test, p-value, others

Supervised Machine Learning with R and Python

- Regression
- Classification

Unsupervised Machine Learning with R and Python

- Clustering

TEACHING METHODOLOGY

General methodological aspects of the subject

The use of ChatGPT or any other Generative Artificial Intelligence in ay assessment activity that is not explicitly authorised the the instructor will be considered a seriours offense accoriding to the University's General Regulations. Article 168.2e: "engaging in actions aimed at falsifying or defrauding the academic performance evaluation systems". The consequence of such actions may include "temporary expulsion of up to three months or a ban on taking exams in the next examination session following the imposition of the sanction, in one or more courses in which the student is enroled. A first-time offence of tis article, in addition to resulting in a failing grade (0) in the respective course, will be sanctioned with a ban on taking the exam fo that course in the next session."

In other words, the use of ChatGPT or any other GAI is strictly prohibited in any assessment activity unless the instructor has explicitly stated that is is allowed.

In-class Methodology: Activities

- Teaching lectures to introduce the basic of each topic.
- Development of a model example by the teacher.
- Guided practice of cases applying the concepts learnt.

Non-Presential Methodology: Activities

- Tutored personal work.
- Individual and group practice work.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS
NON-PRESENTIAL HOURS
ECTS CREDITS: 3,0 (0 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	Individual - numeric grade: 0 - 10	50 %
Final work and public oral presentation	Individual or in group - numeric grade: 0 - 10	40 %
Attendance and participation	Individual - Numeric grade: 0 - 10	10 %

Ratings

To pass the course, the student should obtain at least the following:

- Attendance requirements: 80%
- Final exam: 5/10
- Oral presentation: 5/10

Total grade weighting all components equal or superior to 5/10.

Those students who do not pass the subject will be able to submit the cases and exercises and repeat the oral presentation and/or the exam.

Students with an attendance waiver

In order to pass the module, these students will have to submit the cases and exercises and repeat the oral presentation. Total grade weighting all components equal or superior to 5/10.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

- Class notes
- Handouts & slides
- External resources

Complementary Bibliography

BUSINESS & DATA SCIENCE

- Provost, F., Fawcett, T. (2013) *Data Science for Business: What you need to know about data mining and data-analytic thinking*. Ed. O'Reilly Media. ISBN 9781449361327
- Shmueli et al. (2017) *Data Mining for Business Analytics: Concepts, Techniques, and Applications in R*. Ed. Wiley.
- Wisniewsky, M., Shafti, F. (2020) *Quantitative Analysis for Decision Makers, 7th Edition* (formerly known as Quantitative Methods for Decision Makers), 7th Edition. Ed. Pearson. ISBN: 9781292276663

BUSINESS & BIG DATA

- Marr, B. B. (2015) *Big Data: Using Smart Big Data, Analytics and Metrics to Make Better Decisions and Improve Performance*. Ed. John Wiley & Sons. ISBN 9781118965832.
- Marr, B. B. (2016) *Big Data: how 45 successful companies used Big Data analytics to deliver extraordinary results.* Ed Willey. ISBN 9781119231387.

TECHNICAL

- Bishop, C. (2009) *Pattern Recognition and Machine Learning.* Ed. Springer. ISBN 9781493938438.
- EMC Education Services (2015) *Data Science & Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data.* Ed. Wiley (2015). ISBN:9781118876138
- James, Gareth, et al. (2013) *An introduction to statistical learning*. Vol. 112. New York. Ed. Springer.
- Murphy, K. (2012) *Machine Learning, a probabilistic perspective.* The MIT Press. ISBN 9780262018029.