COMILLAS
UNIVERSIDAD PONTIFICIA
ICAI ICADE CIHS

Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Data Visualization
Subject code	DTC-BA-316
Mainprogram	Grado en Análisis de Negocios/Business Analytics
Involved programs	Grado en Análisis de Negocios/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/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] Grado en Admin. y Dirección de Emp. y Grado en Análisis de Negocios/Bachelor in Business Analytics [Second year] Grado en Ingeniería en Tecnologías de Telecom. y Grado en Análisis de Negocios/Business Analytics [Third year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	3,0 ECTS
Type	Obligatoria (Grado)
Department	Department of Telematics and Computer Sciencies
Coordinator	Luis Francisco Sánchez Merchante
Office hours	To be arranged with the teacher

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

The recent update of the business paradigm to data-centric business models has favoured the rise of different visualisation techniques. Not only those that provide data exploration or data explanation capabilities but particularly those that allow the creation of

dashboards. These new dashboards make it possible to replace traditional reports that are fundamentally centred on statistics and data tables with visualisations that are much quicker to interpret, in some cases interactive and with the capacity to be updated in real-time. These new technologies include mechanisms that allow permanent monitoring of these dashboards from any mobile device. The recent boom in visualisation and data-based storytelling represents a clear improvement in the way in which results were traditionally communicated to the executive positions of a company, offering the possibility of making decisions with a greater amount of actionable and up-to-date information.

The aim of the course is to familiarise students with the theory of visualisation and, in particular, with the generation of statistical graphs that favour the exploratory analysis of data. Many of the techniques and tools taught in the course are used in industry as a graphical synthesis tool for large data sets.

The course is structured in three sections. In the first section, the student will understand how the brain processes different visual stimuli and how this can be exploited to increase the effectiveness of a visualisation; in this same block, the student will also become familiar with concepts about grammar and semantics as well as being confronted with numerous use cases. In the second section, the student will be introduced to the tools currently used in the industry, mainly divided into dashboard building applications and visualisation libraries using programming languages. Both the dashboard building frameworks and the more programmatic tools are perfectly valid mechanisms for the statistical representation of data and for carrying out exploratory data analysis. The last section will present students with various practical challenges that they will have to solve throughout the course, culminating in a personal visualisation proposal for a set of data chosen by mutual agreement between the teacher and the student, selecting the technological solution that best suits the use case from among the many possibilities discussed during the course.

At the end of the course, students should be able to differentiate between the different visualisation technologies and have the necessary criteria to choose between them, as well as have acquired the ability to design and build visualisations that allow them to transmit a story based on data in the most efficient way possible.

Prerequisites

Basic knowledge of R and Python

Competencies - Objectives

Competences

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

Theme 1: Introduction

- Perception and cognition
- Visualisation or infographics
- Exploration or explanation
- Purposes of visualisation
- Graphic excellence
- Bibliography

Theme 2: Visualisation basics

- Same facts, different stories
- Grammar of graphs
- Graphics semantics
- Types of graphs
- Enhancing a graph
- Multidimensional visualisations
- Design tools and environments
- Success stories

Theme 3: Programmatic visualisation

Using programming languages such as R, Python,...

- Statistical visualisations
- Construction of dashboards
- Exploratory analysis and visualisation

Theme 4: Commercial visualisation environments

- Building dashboards with multipurpose tools such as Tableau, PowerBI, Qlick,...

Theme 5: Real-time metrics visualisation tools

- Trends in tools for building monitoring dashboards

TEACHING METHODOLOGY

General methodological aspects of the subject

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS	
Lecciones de Carácter expositivo	Ejercicios y resolución de casos y de problemas
15.00	17.00
NON-PRESENTIAL HOURS	
Estudios individual y/o en grupo, y lectura organizada	Trabajos monográficos y de investigación, individuales o colectivos
29.00	29.00
ECTS CREDITS: 3,0 (90,00 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
Practical exams at the end of multi-purpose and programmatic tools.	Evaluate graphical excellence and commitment of the requirements	55
Group work	Evaluate compliance with the proposed practice	15
Individual evaluation of theoretical/practical knowledge of each tool	Choosing the correct answer in a quiz	30

Ratings

The grade in the ordinary call of the subject will be obtained as follows:

- 55% will be the grade of the practical exams on the tools.
- 30% will be the qualification of short exams of mainly theoretical content.
- 15% will be the grade for practical work in groups.

The grade in the extraordinary call:

- 20% will be an individual practical exam on a tool chosen by the lecturer.
- 40% will be a theoretical/practical test on the tools and fundamentals of visualisation seen during the course.
- 40% evaluation of work and student participation through the grading of exams and practical work carried out during the course.

In order to pass the course, students must have at least 5 points out of 10 in the final exam block in the ordinary exam session and in the sum of the individual practical exam and multiple-choice exam blocks in the extraordinary exam session.

Policy on the Use of Artificial Intelligence Tools in the Course

This course adopts a clear policy regarding the use of artificial intelligence (AI) tools, with the aim of ensuring academic integrity, fostering the development of students' own competencies, and guaranteeing that the assessed learning outcomes are attributable to the student.

To support the interpretation and implementation of this policy, the **AI Assessment Scale** proposed by Perkins, Furze, Roe & MacVaugh (2024) will be used as a reference framework. This scale defines five levels of AI integration based on the degree of assistance allowed, as illustrated in the following figure:

1	NO AI	The assessment is completed entirely without AI assistance in a controlled environment, ensuring that students rely solely on their existing knowledge, understanding, and skills **You must not use AI at any point during the assessment. You must demonstrate your core skills and knowledge.**
2	AI PLANNING	AI may be used for pre-task activities such as brainstorming, outlining and initial research. This level focuses on the effective use of AI for planning, synthesis, and ideation, but assessments should emphasise the ability to develop and refine these ideas independently. **You may use AI for planning, idea development, and research. Your final submission should show how you have developed and refined these ideas.**
3	AI COLLABORATION	AI may be used to help complete the task, including idea generation, drafting, feedback, and refinement. Students should critically evaluate and modify the AI suggested outputs, demonstrating their understanding. **You may use AI to assist with specific tasks such as drafting text, refining and evaluating your work. You must critically evaluate and modify any AI-generated content you use.**
4	FULL AI	AI may be used to complete any elements of the task, with students directing AI to achieve the assessment goals. Assessments at this level may also require engagement with AI to achieve goals and solve problems. **You may use AI extensively throughout your work either as you wish, or as specifically directed in your assessment. Focus on directing AI to achieve your goals while demonstrating your critical thinking.**
5	AI EXPLORATION	AI is used creatively to enhance problem-solving, generate novel insights, or develop innovative solutions to solve problems. Students and educators co-design assessments to explore unique AI applications within the field of study. **You should use AI creatively to solve the task, potentially co-designing new approaches with your instructor.**

 Perkins, Furze, Roe & MacVaugh (2024). The AI Assessment Scale

For each type of course activity, the following levels will apply by default:

- **Support in studying course materials, resolving doubts, or clarifying procedures**: **Level 4 – Full AI**. Students may freely use AI tools to support their understanding, provided that such assistance does not replace their own learning process.
- **Graded quizzes completed during class time**: **Level 1 – No AI**. These activities must be completed without any technological assistance, relying solely on the student's acquired knowledge.
- **Graded assignments or exercises completed and submitted during class time**: **Level 1 – No AI**. Similarly, all work must originate directly from the student, without external assistance.
- **Graded assignments or exercises with a multi-day deadline**: **Level 3 – AI Collaboration**. The use of AI tools is permitted to support specific tasks such as drafting, restructuring, or reviewing. However, students must critically evaluate and modify any AI-generated content they choose to incorporate, taking full responsibility for its quality and accuracy.

Additional Conditions and Disclaimers

In addition to the scenarios described above, the following conditions apply:

1. **Flexibility under instructor guidance**: The usage scenarios may be modified at any time at the explicit discretion of the course instructor, depending on the nature and objectives of each activity. Furthermore, the instructor may request the submission of the interaction history with the AI tool used, as part of the supporting documentation.
2. **Mandatory oral assessment if required**: The instructor reserves the right to conduct an individual oral examination of the submitted work, in any case and at any level, in order to verify the authorship of the content and the student's understanding of the knowledge being assessed.
3. **Scope of the policy**: This policy is not limited to the use of commercial language model (LLM) interfaces such as ChatGPT, Copilot, or Gemini. It also applies to:

- Search engines with embedded generative features
- Office or programming application plugins that include AI assistants
- Locally deployed or open-source models
- Any technology capable of automatically generating text, code, images, calculations, or other types of content relevant to the course

Ultimately, any form of generative assistance shall be considered subject to this policy, regardless of its origin or format of use.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography

It's provided together with the documentation in each thematic block.