Syllabus
2025 - 2026

TECHNICAL SHEET OF THE SUBJECT

Data of the subject	
Subject name	Tratamiento de Datos/Data Processing
Subject code	E000012798
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 [First 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 [First year] Grado en Admin. y Dirección de Emp. y Grado en Análisis de Negocios/Bachelor in Business Analytics [First year]
Level	Reglada Grado Europeo
Quarter	Semestral
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Department of Telematics and Computer Sciencies
Coordinator	Mario Castro
Schedule	Consultar a tal efecto los horarios de los diferentes grupos y titulaciones en los que se imparte.
Office hours	Solicitar cita previa por email al profesor de vuestro grupo.

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SPECIFIC DATA OF THE SUBJECT

Contextualization of the subject

Contribution to the professional profile of the degree

In the professional profile of the graduate in Business Analytics-E3/ Business Analytics-E2/ Business Analytics-E6 degree, this subject aims to provide the student with an introductory and cross-cutting view, applicable to all areas of business administration, on how to use data to support various types of business decision-making.

Working with data involves several phases, ranging from searching and obtaining raw data to gaining knowledge through its proper manipulation in line with set objectives: acquisition, enrichment, cleaning, summarization, visualization, analysis, drawing conclusions, and communicating the results.

Specifically, the overall intended learning objective is to effectively communicate to a non-technical audience facts, conclusions, and recommendations based on data using the digital tools Excel and Pandas—tools that are very useful, widely used in the business world, and highly intuitive in terms of their handling.

The subject will primarily use Excel as a computer tool to support data processing and analysis, employing concepts and descriptive statistics to tabulate, summarize, visualize, and analyze information with a holistic and cross-cutting approach. Additionally, thanks to the varied, engaging, and progressively complex examples, even first-year students can acquire the basic tools to work independently with

data in any discipline that requires it (nearly all disciplines today). Most importantly, students develop a positive outlook and engagement with data.

Subsequently, the Pandas library will be used as a tool within the realm of Python programming, with the student having acquired basic knowledge in the first semester. Pandas functionalities are specialized in handling and analyzing massive data structures, managing numerous formats, providing ease of use, data access, and manipulation through a library with a myriad of mathematical, statistical, and financial functions, ultimately facilitating the presentation and conclusions of the data.

Prerequisites

Fundamentals of programming in Python.

Competencies - Objectives

Competences

Learning outcomes

HA10	Resultados del proceso de Formación y de Aprendizaje: HA10. Analiza, plantea y resuelve problemas en el mundo real, con algoritmos, herramientas, funciones de una hoja de cálculo y librerías científicas de programación aplicadas a los datos obtenidos de diversas fuentes.
CM11	Resultados del proceso de Formación y de Aprendizaje: CM11. Analiza e identifica problemas en un entorno de datos masivos, elaborando programas o soluciones automatizadas que permiten la gestión y explotación de los datos.
RA1	Introducción a la Programación/ Introduction to Programming (6 ECTS) RA1. Conocer y comprender los fundamentos de un lenguaje de programación, que permiten al alumno elaborar códigos orientados al tratamiento de la información.
RA2	Introducción a la Programación/ Introduction to Programming (6 ECTS). RA2. Utilizar los algoritmos, funciones y librerías idóneos para la adquisición y gestión de la información, y ser capaz de integrarla de una manera racional.
RA1	Tratamiento de Datos/ Data Processing. RA1 Ser capaz de automatizar extracciones programáticas de la información deseada, tanto de APIs como de páginas web, trabajando con los formatos de datos más utilizados en la actualidad (CSV, JSON, HTML, XML, XLSX...), procesándolos y visualizándolos./
RA2	Tratamiento de Datos/ Data Processing. RA2 Procesar y transformar información con el objetivo de poseer un dato de alta calidad: limpio, homogéneo y estandarizado.
RA1	Ciberseguridad / Cybersecurity RA1 Conocer los principios generales de la ciberseguridad, incluyendo gestión de riesgos, técnicas de cifrado y firma electrónica, sistemas de detección y protección, y conceptos de resiliencia y continuidad de negocio.
RA2	Ciberseguridad / Cybersecurity RA2 Conocer la normativa y legislación en el ámbito de la seguridad, y especialmente las relativas a protección de datos y privacidad
RA1	Introducción a la Estadística Computacional/Introduction to Statistical Computing. RA1 Conocer, comprender e interpretar las principales medidas estadísticas y gráficos básicos utilizados habitualmente en ingeniería para describir un conjunto de datos. Conocer también las principales distribuciones de probabilidad discretas y continuas, y aplicar las mismas en la resolución de problemas reales.

RA2	Introducción a la Estadística Computacional/Introduction to Statistical Computing. RA2 Conocer, comprender y manejar los conceptos básicos de probabilidad y los procedimientos y teoremas fundamentales para el cálculo de probabilidades de sucesos.
RA1	Estadística Computacional/Statistical Computing. RA1 Conocer y manejar software estadístico para calcular medidas estadísticas y generar gráficos descriptivos de interés a partir de un conjunto de datos.
RA2	Estadística Computacional/Statistical Computing. RA2 Estimar distribuciones de probabilidad a partir de un conjunto de datos utilizando software estadístico o lenguajes de programación.
RA1	Desarrollo de Aplicaciones Orientadas a Objetos/Object-Oriented Application Development. RA1 Realizar el análisis y el diseño detallado de las aplicaciones informáticas a partir de patrones de diseño orientados a objetos. Comprender los diferentes tipos de relaciones de los diagramas de clase UML. Conocer algunos de los patrones de diseño más importantes como MVC, DAO o Singleton. Diseñar aplicaciones separando claramente sus módulos entre diferentes capas que intervienen (presentación, lógica, comunicaciones, entrada/salida, etc.).
RA2	Desarrollo de Aplicaciones Orientadas a Objetos/Object-Oriented Application Development. RA2 Diseñar y codificar aplicaciones visuales utilizando componentes de especificaciones futuras. Realizar diseños usables y amigables de aplicaciones basadas en ventanas. Implementar aplicaciones visuales con componentes más complejos no explicados en el aula. Entender y aplicar los diferentes tipos existentes de materializar la gestión de eventos. Implementar soluciones web basadas en tecnología Java o similar del lado del cliente.

THEMATIC BLOCKS AND CONTENTS

Contents - Thematic Blocks

The subject is divided into two blocks, according to the technology used:

Block I - Microsoft Excel

1. Basic concepts
2. Complex formulas
3. Charts
4. Advanced functions
5. Data analysis
6. Macros

Block II - Pandas

1. Introduction to NumPy and Pandas.
2. Basic Data Manipulation
3. Cleaning and Treatment of Data
4. Advanced Data Manipulation
5. Advanced Data Processing
6. Data Visualization

LABORATORY PRACTICES

In all topics, students will carry out practical sessions in which they will have to solve a set of problems with creativity, critical thinking, and deciding on the best and most efficient solution in each case. The student will engage in real-world scenarios from the work and business environment tailored to the level of knowledge in each part of the syllabus.

TEACHING METHODOLOGY

General methodological aspects of the subject

In-class Methodology: Activities

Lecture and general presentations. Presentation of the main concepts and procedures through the explanation by the professor. It will include dynamic presentations, small practical examples, and the regulated or spontaneous participation of students.

Laboratory practices, preparation, and subsequent work. Working groups will be formed to carry out regulated laboratory practices or laboratory designs. Laboratory practices will require prior preparation work as well as the drafting of a final laboratory report.

Resolution of practical problems and follow-up tests. The resolution will be carried out cooperatively by the professor and students, so that the student is involved in their own learning, and the steps leading to the problem's resolution are undertaken by the student with the guidance of the professor, who becomes a learning guide.

Tutorials. They will be conducted in groups and individually to address any questions that students may have after working on various topics. Furthermore, they will always be aimed at guiding the student in their learning process.

Non-Presential Methodology: Activities

The main objective of non-face-to-face work is to understand and grasp the theoretical concepts of the subject, as well as to be able to apply this knowledge to solve various types of problems.

- Individual practical work. Learning activities that will be carried out individually outside of class hours, requiring some form of research or the reading of various texts.
- Various types of questionnaires to help the student reinforce what they have learned and self-assess.
- Resolution of practical problems to be solved outside of class hours by the student. The student must use and internalize the knowledge provided in the subject. Correction with the entire class will be carried out by either some of the students or the teacher depending on the cases. Individual correction of each exercise will be carried out by the student themselves or another classmate, depending on the cases (exchange method).
- Group work. Working groups will be formed whose task will be the realization and delivery of a final product, part of which will be done during class hours, where the teacher will guide the group in achieving the objectives, as well as outside of class hours. This task will require sharing information and resources among members with a view to achieving a common goal.

SUMMARY STUDENT WORKING HOURS

CLASSROOM HOURS		
Lecciones de carácter expositivo	Ejercicios y resolución de casos y de problemas	Exposición pública de temas o trabajos
25.00	30.00	5.00
NON-PRESENTIAL HOURS		

Ejercicios y resolución de casos y de problemas	Estudio y lectura organizada	Trabajos monográficos y de investigación, individuales o colectivos
40.00	20.00	30.00
		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 with two parts: Excel and Pandas	The student's ability to analyse, understand, and solve the practical problems presented and adapt them to real-life situations will be assessed. The evaluation will consider the solutions' clarity and adherence to the established rules in the subject. Submitting the exam incorrectly, late, or without following the given instructions (i.e. wrong formats, wrong number of files, absence of FULL recording, etc) will result in a grade of NP (Not Present).	60 %
Intermediate Exam	Specific test in the middle of the course, to evaluate the progression of the student	20
Evaluation of individual assignments.	The ability of students to solve individual assignments of practical problems will be evaluated, as well as their analytical skills, expression, organization of ideas, and presentation.	10
Group work and Attendance and participation in class, along with the completion of questionnaires.	The ability to work in a group to solve practical problems applied to the subject will be evaluated. Therefore, the final work submitted will be assessed, along with the student's ability to work in a group, divide tasks, and obtain a final product of the team's work.	10

Ratings

Ordinary Call:

The percentage for the final grade will be:

- Final Exam - Two parts: Excel and Pandas [60%]

- Intermediate Exam [20%]
- Individual work: Quizzes + Non-face-to-face work [10%]
- Group work [10%]

A minimum score of 5 on both exams (Excel and Pandas) is required. If any section is not passed , the course will be failed, and the final grade will be the minimum of both exam sections.

Submitting the exam incorrectly, late, or without following the given instructions (i.e. wrong formats, wrong number of files, absence of FULL recording, etc) will result in a grade of NP (Not Present).

Extraordinary Call:

The percentage for the final grade will be:

- Final Exam - Two parts: Excel and Pandas [60%]
- Intermediate Exam [20%]
- Individual work: Quizzes + Non-face-to-face work [10%]
- Group work [10%]

A minimum score of 5 on both exams (Excel and Pandas) is required to pass the course. If any section is not passed , the course will be failed, and the final grade will be the minimum of both exam sections.

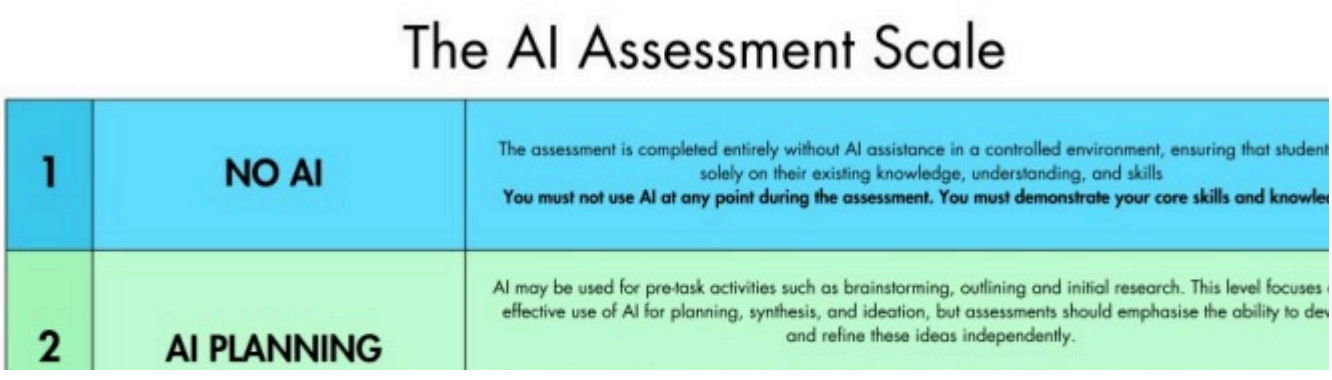
If the grade of the extraordinary exam in both sections is greater than or equal to 5, the final grade of the course will be the highest between 90% of the final exam grade and the final grade obtained by applying the continuous assessment weighting with the weights indicated above.

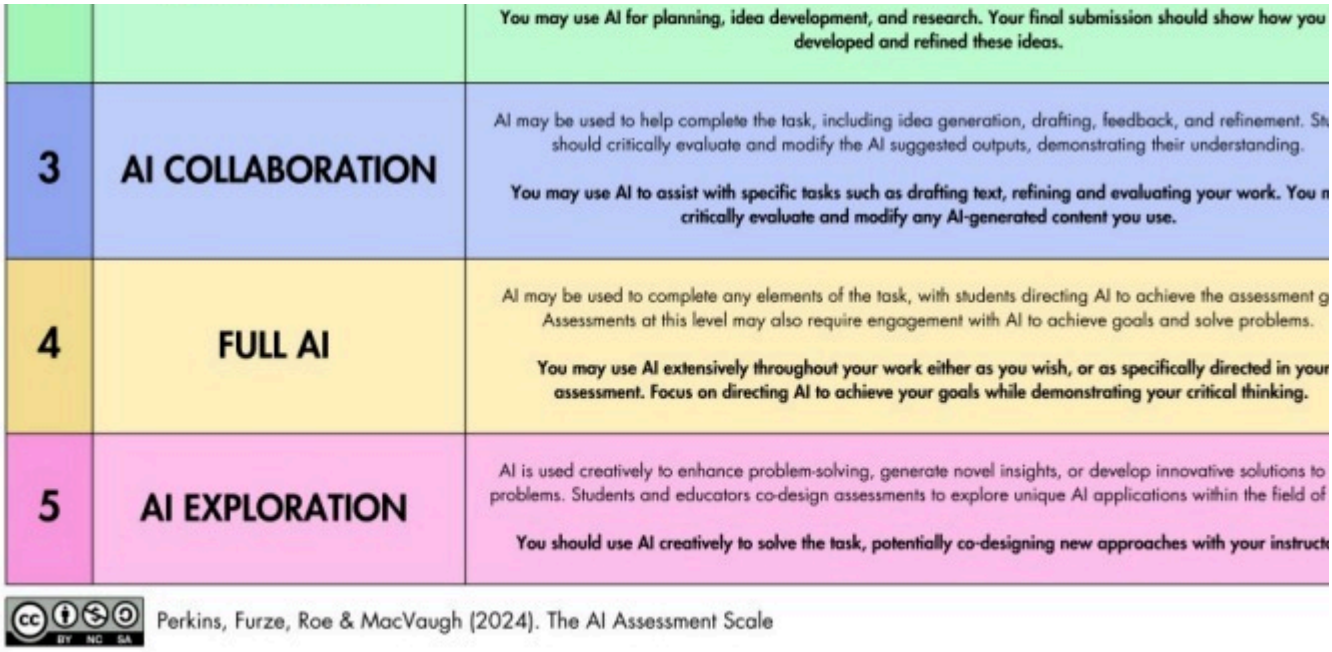
Submitting the exam incorrectly, late, or without following the given instructions (i.e. wrong formats, wrong number of files, absence of FULL recording, etc) will result in a grade of NP (Not Present).

The general academic regulations as well as the code of conduct must be observed throughout the course and during the exams. Failure to do so may result in a grade of 0.

Policy on the Use of Artificial Intelligence Tools in the Course

This course incorporates a clear policy regarding the use of artificial intelligence (AI) tools, aimed at ensuring academic integrity, fostering the development of individual competencies, and guaranteeing that the assessed learning is attributable to the student. To facilitate the interpretation and application of this policy, the *AI Assessment Scale* proposed by Perkins, Furze, Roe & MacVaugh (2024) will be adopted as the reference framework. This scale considers five levels of AI integration according to the degree of assistance allowed, illustrated in the following figure:





		You may use AI for planning, idea development, and research. Your final submission should show how you developed and refined these ideas.
3	AI COLLABORATION	AI may be used to help complete the task, including idea generation, drafting, feedback, and refinement. St 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 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 g 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 problems. Students and educators co-design assessments to explore unique AI applications within the field of **You should use AI creatively to solve the task, potentially co-designing new approaches with your instructo**

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

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

Support for studying learning materials, solving 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.

In-class graded quizzes: Level 1 – *No AI*. These activities must be completed without any technological assistance, relying exclusively on the knowledge acquired.

In-class graded assignments or exercises: Level 1 – *No AI*. Likewise, all submitted work must originate directly from the student without 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 assess and modify any AI-generated content they choose to incorporate, assuming full responsibility for its quality and accuracy.

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

Flexibility under instructor guidance: These usage scenarios may be modified at any time by explicit instruction of the teaching staff, depending on the nature and objectives of each activity. Likewise, instructors may require submission of the interaction history with the AI tool used as part of the supporting documentation.

Mandatory oral assessment if necessary: The teaching staff reserves the right to carry out an individual oral examination of any submitted work, regardless of the activity or AI integration level, in order to verify the authorship of the content and the student's understanding of the evaluated knowledge.

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 functions

Office or programming applications with AI assistants

Locally deployed or open-source models

Any technology that provides automated generation of text, code, images, calculations, or other content relevant to the course

In short, any type of generative assistance will be considered subject to this policy, regardless of its origin or format of use.

WORK PLAN AND SCHEDULE

Activities	Date of realization	Delivery date
Multiple-choice tests - Excel		At the end of each content block or project.
Submission of Non-face-to-face Work - Excel and Pandas		At the end of each content block or project.
Project - Group Work		At the end of each technical block - Excel and Pand
Exam Block I - Excel		At the end of Block I of the syllabus.
Exam Block II - Pandas		At the end of Block II of the syllabus.

BIBLIOGRAPHY AND RESOURCES

Basic Bibliography
Materials and Moodle presentations.