



COMILLAS

UNIVERSIDAD PONTIFICIA

ICAI

ICADE

CIHS

Syllabus
2024 - 2025

TECHNICAL SHEET OF THE SUBJECT

| Data of the subject | |
|---------------------|--|
| Subject name | Tratamiento de Datos/Data Processing |
| Subject code | E000012798 |
| Main program | 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 Sciences |
| 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. |

| Teacher Information | |
|---------------------|--|
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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. |



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|------------|--|
| 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

| Evaluation activities | Evaluation criteria | Weight |
|---|--|--------|
| Two final exams, one related to Excel and the other to 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. | 60 |
| Attendance and participation in class, along with the completion of questionnaires. | The student's attendance and punctuality will be assessed, as well as their proactive participation in the activities. Simple questionnaires summarizing the topics covered in class will be conducted in the classroom, which the student must complete. | 10 |
| 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. | 15 |
| Group work. | 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. | 15 |

Ratings

Ordinary Call:

The percentage for the final grade will be:

- Final grade in Block I - Excel [50%]
- Final grade in Block II - Pandas [50%]
- Both parts must be passed with a minimum score of 5 to calculate the average.

Final Grade Block I - Excel:

- Final Excel Exam [60%]
- Quizzes (40%) + Non-face-to-face work (60%) total weight [15%]
- Group work + Student participation [25%]



To be exempt from the Excel exam, a minimum score of 5 on the exam is required.

Final Grade Block II - Pandas:

- Final Pandas Exam [60%]
- Non-face-to-face work [15%]
- Group work + Student participation [25%]

To pass the subject, the minimum grade for both exams must be at least 5.

Extraordinary Call:

The percentage for the final grade will be:

- Final Exam [60%]
- Non-face-to-face work [15%]
- Group work [25%]

To pass the subject, the minimum grade for the Extraordinary Final Exam must be 5.

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.