



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Informáticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000853 - Data Processes

DEGREE PROGRAMME

10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER

2025/26 - Semester 1

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1. Description

1.1. Subject details

Name of the subject	103000853 - Data Processes
No of credits	4.5 ECTS
Type	Optional/elective
Academic year of the programme	First year
Semester of tuition	Semester 1
Tuition period	September-January
Tuition languages	English
Degree programme	10AZ - Master Universitario en Innovación Digital
Centre	10 - E.T.S. De Ingenieros Informáticos
Academic year	2025-26

2. Faculty

2.1. Faculty members with subject teaching role

Name and surname	Office/Room	Email	Tutoring hours *
Antonio Jesus Diaz Honrubia	4303	antoniojesus.diaz@upm.es	Sin horario. contact the professor
Luis Mengual Galan		luis.mengual@upm.es	Sin horario. contact the professor

Ernestina Menasalvas Ruiz (Subject coordinator)	4303	ernestina.menasalvas@upm. es	Sin horario. contact the professor
Alejandro Rodriguez Gonzalez	4302	alejandro.rg@upm.es	Sin horario. contact the professor
Lucia Prieto Santamaria	4302	lucia.prieto.santamaria@upm .es	Sin horario. contact the professor

* The tutoring schedule is indicative and subject to possible changes. Please check tutoring times with the faculty member in charge.

2.3. External faculty

Name and surname	Email	Institution
Andrea Alvarez Perez	andrea.alvarezp@upm.es	Centro de Tecnología Biomédica
David Gomez Ortiz	da.gomez@upm.es	Centro de Tecnología Biomédica

3. Prior knowledge recommended to take the subject

3.1. Recommended (passed) subjects

The subject - recommended (passed), are not defined.

3.2. Other recommended learning outcomes

- Databases
- relational data model
- SQL

4. Skills and learning outcomes *

4.1. Skills to be learned

CE-CD07 - Capacidad para diseñar y gestionar proyectos de ciencia de datos

4.2. Learning outcomes

RA75 - Understand the basics of the Knowledge Discovery Process, and its application to time series and complex data

RA49 - apply IA techniques in real data scenarios

* The Learning Guides should reflect the Skills and Learning Outcomes in the same way as indicated in the Degree Verification Memory. For this reason, they have not been translated into English and appear in Spanish.

5. Brief description of the subject and syllabus

5.1. Brief description of the subject

In this course we will deepen on the importance of data for an organization. In fact, the course is centered on the process of extraction of knowledge from databases as a support for decision making.

The planning and management of a project of data science project is the main goal of this course.

Consequently the course will start with the analysis of data sources in an organization and very briefly analyzed data base management systems. Emphasis will be put on the ethical aspects regarding data management and knowledge extraction.

Later students will understand the data value chain and will go deep into the process of knowledge extraction. At this stage CRISP-Dm methodology will be used.

The course will follow on the different phases of the process: i) business understanding, ii) data understanding, iii) data preparation, iv) modeling v) evaluation and vi) deployment.

Through all the phases the main emphasis will be on students getting hands on the different steps, techniques,

algorithms and tools.

The course will end with use cases in different domains.

5.2. Syllabus

1. Introduction

- 1.1. Course description.
- 1.2. Data Science and Data Scientist Skills.
- 1.3. The Value hidden in data.

2. Operational Data bases Vs Decisional databases

- 2.1. The BIG Data Value Chain.
- 2.2. Data Warehouse.
- 2.3. Data Lakes

3. The process of Knowledge Discovery in Databases

- 3.1. CRISP-DM

4. Business Understanding

- 4.1. Goal of BU.
- 4.2. Planning of a DataScience project.

5. Data Understanding

- 5.1. Understanding data.
- 5.2. Nulls and outliers detection.
- 5.3. Correlation analysis

6. Data Preparation

- 6.1. Preparing data for mining: dealing with problems encountered in understanding, transforming data, discretization, data reduction, agregation, ?.

7. Data mining/data modeling

- 7.1. Type of problems. Data nature , data problems and possible algorithms.
- 7.2. Classification, association and clustering
- 7.3. Complex Networks

8. Evaluation and Deployment

8.1. Evaluation of the models.

8.2. Deployment of the models

9. Ethics

9.1. GDPR and implications in Data Science

6. Schedule

6.1. Subject schedule*

Week	Type 1 activities	Type 2 activities	Distant / On-line	Assessment activities
1	Unit 1 Duration: 02:00 Lecture			
2	Unit 2 Duration: 02:00 Lecture			
3	Unit 3 Duration: 02:00 Lecture			
4	Unit 4 Duration: 03:00 Lecture			
5	Unit 5 Duration: 03:00 Lecture			
6	Unit 6 Duration: 03:00 Lecture			
7	Unit 6 Duration: 02:00 Lecture			
8	Unit 7 Duration: 02:00 Lecture			
9	Unit 7 Duration: 02:00 Lecture			
10	Evaluation 1st assignmet Duration: 02:00 Additional activities 1st assignment Duration: 02:00 Additional activities			Evaluation First Assigment Group presentation Progressive assessment Presential Duration: 02:00
11	Unit 7 Duration: 02:00 Lecture			
12	Unit 8 Duration: 02:00 Lecture			

13	Unit 8 Duration: 02:00 Lecture			
14	Unit 9 Duration: 02:00 Lecture			
15	Evaluation 2nd assigment Duration: 02:00 Additional activities 2nd assigment Duration: 02:00 Additional activities			Evaluation Second Assigment Group presentation Progressive assessment Presential Duration: 02:00
16				
17	examen Duration: 02:00 Additional activities			Exam Written test Progressive assessment and Global Examination Presential Duration: 02:00 Exam. This will include the recoverable part of the assigments. Written test Global examination Presential Duration: 02:00

Depending on the programme study plan, total values will be calculated according to the ECTS credit unit as 26/27 hours of student face-to-face contact and independent study time.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Assessment

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
10	Evaluation First Assigment	Group presentation	Face-to-face	02:00	25%	4 / 10	CE-CD07
15	Evaluation Second Assigment	Group presentation	Face-to-face	02:00	25%	4 / 10	CE-CD07
17	Exam	Written test	Face-to-face	02:00	50%	4 / 10	CE-CD07

7.1.2. Global examination

Week	Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
17	Exam	Written test	Face-to-face	02:00	50%	4 / 10	CE-CD07
17	Exam. This will include the recoverable part of the assigments.	Written test	Face-to-face	02:00	100%	5 / 10	CE-CD07

7.1.3. Referred (re-sit) examination

Description	Modality	Type	Duration	Weight	Minimum grade	Evaluated skills
Exam in July	Written test	Face-to-face	02:00	100%	5 / 10	CE-CD07

7.2. Assessment criteria

The course will be evaluated by:

- 2 practical assignments: They are recoverable. This means that the student will have an exam of the assignment in the exam in case they did not follow them along the course.
- 1 exam

Practical assignments will be done in groups among those enrolled in the course at the beginning of the academic year (nature and number of components will be established at the beginning of the course, depending on the number of students enrolled).

In order to pass the course in the fall semester the requirements are:

- 1. To obtain a minimum of 50 points out of 100 in the added evaluation.
- 2. It is MANDATORY to do the exam and do the practical assignment.
- 3. In the exam and on the practical assignments students must obtain a minimum of 40%.

Final score will be calculated as follows:

- 50% Practical assignment (divided between the two assignments)
- 50% Final exam

ts it is appreciated a breach in the duties as college student, the subject coordinator may communicate the headmaster as established in the article 74 (n) of EUPM to have the competences to "propose the initiation of a disciplinary procedure to any College member, by its own initiative or as instance from the "Comisión de Gobierno" to the Rector, pursuant to the statutes and rules of application.

Action procedures against fraudulent behavior

All exams and lab deliverables must be done individually, unless specified otherwise by the teaching staff. If any non-conformity with this criteria is detected (copy, plagiarism, etc.), according to article 13 of the assessment regulations, it will be considered as academic fraud.

According to this same article, all students involved in the fraud will be graded with 0 points (out of 10) in the corresponding call and professors may prepare a special exam only for them in the next official call to assess the learning results of the course.

To this end, all students involved in the fraud are considered accountable, and the above actions will be taken against both active and passive agents.

If a student is involved in a fraudulent behaviour, their marks will not be kept for the extraordinary call. Additionally, no marks will be kept between calls of future academic years.

The above actions do not exclude other actions covered by the normative and laws.

8. Teaching resources

8.1. Teaching resources for the subject

Name	Type	Notes
Moodle	Web resource	http://moodle.upm.es
Data Mining book	Bibliography	Ian Witten, Eibe Frank, Mark Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann, ISBN 978-0-12-374856-0, 2011.
Smart Machines book	Bibliography	Smart Machines: IBM's Watson and the Era of Cognitive Computing. Columbia University Press (October 15, 2013)
Database Systems: The Complete Book (DS:CB), by Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom	Bibliography	
Pang-Ning Tan, Michael Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Addison Wesley (May, 2005).	Bibliography	

Ian Witten, Eibe Frank, Mark Hall, Data Mining: Practical Machine Learning Tools and Techniques, 3rd Edition, Morgan Kaufmann, ISBN 978-0-12-374856-0, 2011.	Bibliography	
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9. Other information

9.1. Other information about the subject