



POLITÉCNICA

INTERNATIONAL
CAMPUS OF
EXCELLENCE

COORDINATION PROCESS OF
LEARNING ACTIVITIES
PR/CL/001



E.T.S. de Ingenieros
Informaticos

ANX-PR/CL/001-01

LEARNING GUIDE

SUBJECT

103000853 - Data Processes

DEGREE PROGRAMME

10AZ - Master Universitario En Innovación Digital

ACADEMIC YEAR & SEMESTER

2021/22 - Semester 1

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Learning guide

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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 |
| 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 - Escuela Tecnica Superior De Ingenieros Informaticos |
| Academic year | 2021-22 |

2. Faculty

2.1. Faculty members with subject teaching role

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

| | | | |
|--|------|-------------------------------------|--|
| Maria Covadonga Fernandez Baizan | | mariacovadonga.fernandez @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 |

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

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

CB06 - Poseer y comprender conocimientos que aporten una base u oportunidad de ser originales en el desarrollo y/o aplicación de ideas, a menudo en un contexto de investigación

CB07 - Que los estudiantes sepan aplicar los conocimientos adquiridos y su capacidad de resolución de problemas en entornos nuevos o poco conocidos dentro de contextos más amplios (o multidisciplinares) relacionados con su área de estudio

CB08 - Que los estudiantes sean capaces de integrar conocimientos y enfrentarse a la complejidad de formular juicios a partir de una información que, siendo incompleta o limitada, incluya reflexiones sobre las responsabilidades sociales y éticas vinculadas a la aplicación de sus conocimientos y juicios

CB10 - Que los estudiantes posean las habilidades de aprendizaje que les permitan continuar estudiando de un modo que habrá de ser en gran medida autodirigido o autónomo.

CG03 - La capacidad de usar la lengua inglesa de manera competente, es decir, con capacitación para tareas complejas de trabajo y estudio.

4.2. Learning outcomes

RA14 - Apply the acquired knowledge in real contexts

RA56 - develop data science projects following a methodology

* 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.

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 | Face-to-face classroom activities | Face-to-face laboratory activities | Distant / On-line | Assessment activities |
|------|-----------------------------------|------------------------------------|--|-----------------------|
| 1 | Unit 1 Duration: 02:00 | | Unit 1 Duration: 02:00 | |
| 2 | Unit 2 Duration: 01:00 | | Unit 2 Duration: 01:00 Unit 2 Duration: 01:00 | |
| 3 | Unit 3 Duration: 01:00 | | Unit 3 Duration: 01:00 Unit 3 Duration: 01:00 | |
| 4 | Unit 4 Duration: 01:00 | | Unit 4 Duration: 01:00 Unit 4 Duration: 01:00 | |
| 5 | Unit 5 Duration: 01:00 | | Unit 5 Duration: 01:00 Unit 5 Duration: 01:00 | |
| 6 | Unit 6 Duration: 01:00 | | Unit 6 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 7 | Unit 6 Duration: 01:00 | | Unit 6 Duration: 01:00 Unit 6 Duration: 01:00 | |

| | | | | |
|----|---------------------------|--|--|--|
| 8 | Unit 6 Duration: 01:00 | | Unit 6 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 9 | Unit 7 Duration: 01:00 | | Unit 7 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 10 | Unit 7 Duration: 01:00 | | Unit 7 Duration: 01:00 Unit 6 Duration: 01:00 | Evaluation First Assigment Continuous assessment Presential Duration: 02:00 |
| 11 | Unit 7 Duration: 01:00 | | Unit 7 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 12 | Unit 8 Duration: 01:00 | | Unit 8 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 13 | Unit 8 Duration: 01:00 | | Unit 8 Duration: 01:00 Unit 6 Duration: 01:00 | |
| 14 | Unit 9 Duration: 02:00 | | Unit 6 Duration: 01:00 | |
| 15 | | | | Evaluation Second Assigment Continuous assessment Presential Duration: 02:00 |
| 16 | | | | Exam Continuous assessment Presential Duration: 02:00 Exam Final examination Presential Duration: 02:00 |

| | | | | |
|----|--|--|--|--|
| 17 | | | | |
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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.

* The schedule is based on an a priori planning of the subject; it might be modified during the academic year, especially considering the COVID19 evolution.

7. Activities and assessment criteria

7.1. Assessment activities

7.1.1. Continuous assessment

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|-----------------------------|----------|--------------|----------|--------|---------------|--------------------------------------|
| 10 | Evaluation First Assigment | | Face-to-face | 02:00 | 25% | 4 / 10 | CB07 CB10 CB06 CB08 CG03 |
| 15 | Evaluation Second Assigment | | Face-to-face | 02:00 | 25% | 4 / 10 | CB06 CB07 CB10 CB08 CG03 |
| 16 | Exam | | Face-to-face | 02:00 | 50% | 4 / 10 | CB06 CB07 CB10 CB08 CG03 |

7.1.2. Final examination

| Week | Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|------|-------------|----------|--------------|----------|--------|---------------|--------------------------------------|
| 16 | Exam | | Face-to-face | 02:00 | 100% | 5 / 10 | CB06 CB07 CB10 CB08 CG03 |

7.1.3. Referred (re-sit) examination

| Description | Modality | Type | Duration | Weight | Minimum grade | Evaluated skills |
|-------------|----------|------|----------|--------|---------------|------------------|
| | | | | | | |

| | | | | | | |
|--------------|--|--------------|-------|------|--------|--------------------------------------|
| Exam in July | | Face-to-face | 02:00 | 100% | 5 / 10 | CB06 CB07 CB10 CB08 CG03 |
|--------------|--|--------------|-------|------|--------|--------------------------------------|

7.2. Assessment criteria

The "only final exam" evaluation will only be offered if the UPM "Normativa Reguladora de los Sistemas de Evaluación" requires so in the academic year 2015-2016, and the procedure to opt in will be as stated by the head of studies. **Continuous evaluation:** The course will be evaluated by:

- 2 practical assignments,
- 1 exam

.Attendance is mandatory (It is allowed not to attend up to 6 hours without proper justification)

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:

- 45% Practical assignment (divided between the two assignments)
- 10% Oral presentation
- 45% Final exam

Final exam evaluation Those students whose extraordinary circumstances cannot perform the continuous evaluation, and having done the final exam evaluation written petition during the first 15 days of the course, will

perform the final exam evaluation without having the opportunity to do the continuous evaluation;

Those students failing to attend 85% of of the lectures will also do the final evaluation.

In these premises, the final exam evaluation will consist of an exam as stated by the head of studies.

Measures against copies and fraud Rights and duties of college students are gathered on the statues of the Universidad Politécnica de Madrid (BOCM de 15 de noviembre de 2010) and in the statutes of the college student (RD 1791/2010 de 30 de diciembre).Article 124 a) of EUPM fixes the duty of the student... "to follow with responsibility and taking advantage of the learning process, knowledge acquisition correspondent to its condition of college student"... and the article 13 of the statutes of the college student in its point d) also specifies as duty of the college student "abstain from the use or cooperation in fraudulent procedures in the evaluation assessments, in the assignments developed or in the official documents of the university".In the case that in the development of the evaluation assessments 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.

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) |

| | | |
|--|--------------|---|
| IBM Watson - How it works | Web resource | http://www.youtube.com/watch?v=_Xcmh1LQB9I |
| Database Systems: The Complete Book (DS:CB), by Hector Garcia-Molina, Jeff Ullman, and Jennifer Widom | Bibliography | |
| "MySQL Administrator's Bible". Sheeri K. Cabral and Keith Murphy. Wiley | 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 | |

9. Other information

9.1. Other information about the subject

teaching will be online.

Platform of the university will be used.

Sessions will be recorded for students to access them anytime.