

## 1. BASIC INFORMATION

<b>Course</b>	APPLICATIONS AND TRENDS IN DATA SCIENCE
<b>Degree program</b>	DEGREE IN DATA SCIENCE
<b>School</b>	SCHOOL OF SCIENCE, ENGINEERING AND DESIGN
<b>Year</b>	3
<b>ECTS</b>	6
<b>Credit type</b>	MANDATORY
<b>Language(s)</b>	ENGLISH
<b>Delivery mode</b>	IN-PERSON
<b>Semester</b>	6
<b>Academic year</b>	2024/2025
<b>Coordinating professor</b>	VÍCTOR MANUEL YESTE MORENO

## 2. PRESENTATION

Data science is a novel area that equips the world of research and business with a comprehensive set of applications. In addition, its novel nature makes it evolve quickly and new trends, tools and applications appear. Not only that but also new problems appear that must be solved for the advancement of science. In this subject, various branches of data science are studied and their main applications are analyzed.

## 3. COMPETENCIES AND LEARNING OUTCOMES

### Knowledges

CON02. Describe the techniques to achieve interoperability between computer systems and integration and aggregation of data from different sources.

### Skills

HAB07. Ability to apply Big Data methodologies, architectures and techniques for effective data management.

### Competences

CP03. Ability to apply computer learning techniques to design and implement applications and systems that use them, including those dedicated to automatic extraction of information and knowledge from large volumes of data.

CP04. Ability to design efficient interfaces in the context of Big Data that guarantee accessibility and usability, using graphical representation and analytical techniques.

CPT01. Create new ideas and concepts from known ideas and concepts, reaching conclusions or solving problems, challenges and situations in an original way.

CPT03. Use information and communication technologies for data research and analysis, research, communication and learning.

CPT05. Cooperate with others in the achievement of a shared goal, participating actively, empathetically and exercising active listening and respect for all members.

CPT06. Integrate analysis with critical thinking in a process of evaluating different ideas or possibilities and their potential for error, based on evidence and objective data that lead to effective and valid decision-making.

### **Resultados de aprendizaje**

Once the subject is passed, the student will be able to:

- Use methodologies, architectures and techniques for the storage and management of large-volume databases to solve practical cases.
- Interpret and apply models and standards to practical cases in the field of big data.
- Describe machine learning techniques, select the most appropriate ones and design solutions to a given problem based on them.
- Gather information to analyze trends in the field of Big Data, connecting these with real cases and reasoning their evolution and future applications.
- Design, develop and evaluate graphical interfaces for data visualization, making use of specific languages and environments.
- Propose alternative solutions and select the most appropriate ones prioritizing usability and user experience.
- Implement computer applications that make use of high-volume databases, including the application of machine learning techniques to obtain models, their visualization, and their interpretation.

## **4. CONTENT**

The subject is organized into the following learning units:

- Introduction to Natural Language Processing, Image Processing and Machine Vision applications, and Recommendation Engines.
- Introduction to trends in data science in the fields of Smart and Connected Industry, Internet of Things, Smart Cities, Wearables and Health Sciences, among others.

## **5. TEACHING-LEARNING METHODOLOGIES**

The types of teaching-learning methodologies used are indicated below:

- Cooperative Learning
- Problem-Based Learning (PBL)
- Lectures
- Case Method
- Learning based on laboratory teaching (laboratory practices, workshop practices, simulation environments)

## 6. LEARNING ACTIVITIES

Listed below are the types of learning activities and the number of hours the student will spend on each one:

**Campus-based mode:**

Learning activity	Number of hours
Master classes and practical seminars	33,6
Problem solving	19,2
Case studies and field studies	11
Laboratory practice	22
Debate and colloquium	5,6
Apprenticeship contract (definition of interests, needs and objectives)	2,2
Autonomous study	60
Tutoring	9,2
Face-to-face tests of knowledge	2,2
<b>TOTAL</b>	<b>150</b>

## 7. ASSESSMENT

Listed below are the assessment systems used and the weight each one carries towards the final course grade:

**Campus-based mode:**

Assessment system	Weight
Face-to-face tests to evaluate theoretical/practical content objectives	60
Non-face tests to evaluate theoretical/practical content objectives	15
Tests to evaluate attitudes	5
Self-assessment and co-evaluation tests	10
Laboratory, workshop or simulation practice tests	10

When you access the course on *Campus Virtual*, you'll find a description of the assessment activities you must complete, as well as the delivery deadline and assessment procedure for each one. Please note that the evaluation procedures for each of the different activities may be specific, two activities need not be weighted with the same weight, and/or the evaluation criteria/headings may be different.

For each of the activities, the evaluation criteria and their weighting will be specified within the block of training activities.

The evaluation process is based on the personal work of each student and presupposes the authenticity of the authorship and originality of the exercises performed. Lack of authenticity in authorship or originality of evaluation tests; copying or plagiarism are irregular behaviors that can have academic and disciplinary consequences. Students who are identified by a teacher as cheating or suspect that they have cheated on any knowledge test or assessable activity. If such students cannot demonstrate otherwise, or alternatively, that they possess the knowledge and skills associated with the test or activity, the test or activity will be evaluated with a grade of 0. Higher sanctions may be considered according to the University's General Coexistence Regulations.

This subject can only be passed based on continuous assessment. The weighted average of each of the continuous assessment marks of each of the blocks of training actions becomes the final grade of the subject. Late deliveries will not be accepted.

To ensure this continuous assessment, you must attend at least 50% of the classes in person to be able to apply for the ordinary call. Virtual attendance (hyflex) to the sessions is allowed exclusively for justified cases typified by the University. Otherwise, it will be recorded as non-attendance. Cases where the student is 15 minutes late will be recorded in the Canvas Attendance system as "Late Assistance" (the system will automatically compute 80% attendance). On the other hand, it will be recorded in the system as "Absence" when the student arrives or leaves more than 15 minutes after/before the start/end of the class (the system will automatically compute a 0% attendance).

After a student is reprimanded three consecutive times for behaviors that are not conducive to a favorable environment for class learning or involve disrespect to the teacher or other peers, the student will be invited to leave the classroom to preserve an appropriate learning environment. Depending on the offense, higher sanctions may be considered according to the University's General Coexistence Regulations.

## **7.1. Ordinary Call**

To pass the course in the Ordinary Call, you must obtain a final course grade of at least 5 out of 10 (weighted average).

In any case, you will need to obtain a grade of 5 out of 10 in each exam to count towards the final grade, along with all the grades corresponding to the other activities.

The average of the assessable activities (deliveries, assignments, projects, challenges, tasks, presentations, etc.) will also have a minimum average grade of 5 out of 10 to pass the subject.

## **7.2. Extraordinary Call**

The activities not passed in the Ordinary Call can be delivered after receiving the corrections corresponding to them by the teacher or those not delivered. Activities that have been passed cannot be delivered. In the case of activities done in groups in Ordinary Call, new working groups could be generated in Extraordinary or done individually.

To pass the subject, you must obtain a grade greater than or equal to 5 out of 10 in the subject's final grade (weighted average). In any case, it will be necessary that you obtain a grade greater than or equal to 5 out of 10 on each partial part of the exam so that it can average with the rest of the activities. If you have passed one of the partial exams, you will do only the partial exam you haven't passed. You won't need to do the exam if you have passed all the partial exams.

The average of the assessable activities (deliveries, assignments, projects, challenges, tasks, presentations, etc.) will also have a minimum average grade of 5 out of 10 to pass the subject.

## 8. SCHEDULE

This table shows the delivery deadline for each assessable activity in the course:

Assessable activities	Deadline
Computer Vision Challenge	March
Recommendation Systems Challenge	March-April
Computer Vision & Recommendation Systems Exam	March-April
Natural Language Processing (NLP) Challenge	April
Trends Challenge	May
Natural Language Processing (NLP) & Trends Exam	Final exam date

This schedule may be subject to changes for logistical reasons relating to the activities. The student will be notified of any change as and when appropriate.

## 9. BIBLIOGRAPHIE

The main reference work for this subject is:

- Dursun Delen, Predictive Analytics: Data Mining, Machine Learning and Data Science for Practitioners, 2nd Edition”, Pearson FT Press.
- Robert Layton, “Learning Data Mining with Python Second Edition”, Packt.
- Glenn J. Myatt , Wayne P. Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, 2nd Edition ”, Wiley.
- David Carmona, “The AI Organization”, O’Reilly.

## 10. EDUCATIONAL GUIDANCE AND DIVERSITY UNIT

From the Educational Guidance and Diversity Unit (ODI) we offer accompaniment to our students throughout their university life to help them achieve their academic achievements. Other pillars of our action are the inclusion of students with specific educational support needs, universal accessibility in the different campuses of the university and equal opportunities.

From this Unit students are offered:

1. Accompaniment and follow-up through the realization of advice and personalized plans to students who need to improve their academic performance.

2. In terms of attention to diversity, non-significant curricular adjustments are made, that is, at the level of methodology and evaluation, in those students with specific educational support needs, thereby pursuing equal opportunities for all students.
3. We offer students different extracurricular training resources to develop various skills that will enrich them in their personal and professional development.
4. Vocational guidance through the provision of tools and advice to students with vocational doubts or who believe that they have made a mistake in the choice of the degree.

Students who need educational support can write to us at:

[orientacioneducativa.uev@universidadeuropea.es](mailto:orientacioneducativa.uev@universidadeuropea.es)

## **11. ONLINE SURVEYS**

Your opinion matters!

The Universidad Europea encourages you to participate in several surveys which help identify the strengths and areas we need to improve regarding professors, degree programs and the teaching-learning process.

The surveys will be made available in the “surveys” section in virtual campus or via e-mail.

Your assessment is necessary for us to improve.

Thank you very much for your participation.

## WORK PLAN FOR THE COURSE

### HOW TO COMMUNICATE WITH YOUR PROFESSOR

Whenever you have a question about the content or activities, don't forget to post it to your course forum so that your classmates can read it.

You might not be the only one with the same question!

If you have a question that you only want to ask your professor, you can send him/her a private message from the Campus Virtual. And if you need to discuss something in more detail, you can arrange an advisory session with your professor.

It's a good idea to check the course forum on a regular basis and read the messages posted by your classmates and professors, as this can be another way to learn.

### SCHEDULE OF ACTIVITIES

This section indicates the schedule of training activities, as well as the delivery dates of the assessable activities of the subject:

Week	Contents	Training/assessable activities	Weight in the evaluation of the assessable activity	ODS	Academic model
4	Computer Vision	Computer Vision Challenge	10%		Practice in simulated environments
7	Recommendation Systems	Recommendation Systems Challenge	10%		Learn to decide based on data
8	Computer Vision and Recommendation Systems	Computer Vision and Recommendation Systems Exam	30%		
12	Natural Language Processing (NLP)	Natural Language Processing (NLP) Challenge	10%		Practice in simulated environments
14	Trends	Trends Challenge	5%	16. Peace, justice and strong institutions	One World Vision
15	Natural Language Processing (NLP) and Trends	Natural Language Processing (NLP) and Trends Exam	30%		Learn to decide based on data

This schedule may undergo modifications that will be notified to the student in a timely manner.

## DESCRIPTION FOR ASSESSMENT ACTIVITIES

**Activity 1: Exam.** The exam will evaluate both theoretical concepts and their application for practical problem solving. The test will last at least one hour.

The evaluation will be made through the following criteria:

- Clear exposition of the processes for the resolution of the problems.
- Proper application of the concepts seen in theory.
- Clarity and efficiency of the code (if applicable)

**Activity 2: Challenge.** Students will carry out a work on the study of an application of the concepts seen in class. They should make a description of the processes and methods used, the relationship with the concepts seen in class and should highlight the key aspects.

The evaluation will be made through the following criteria:

- Presentation.
- Adequate description of the key points of the case to be studied.
- Relationship with the concepts seen in classes and with other similar applications or similar branches.



## RUBRICS FOR ASSESSMENT ACTIVITIES

### Activity 1: Applications Challenge

	Not done	Insufficient	Good	Excellent
Explanation of the process to follow		The explanation is poor or does not correspond to the process carried out	The explanation is adequate but unclear at some point or missing some detail	The explanation is satisfactory and all the necessary concepts appear
Application of theoretical concepts		The theoretical concepts requested have not been correctly applied or have not been identified	Most theoretical concepts have been correctly applied	All theoretical concepts have been properly applied
Result		The result is not consistent with the process or simply wrong	The result is correct but inconsistent with the processes	The results are correct and consistent with the process followed
Presentation		Memory is unclear and confusing, which sometimes makes it impossible to understand	The presentation is good but there is some part that could improve in clarity	The presentation is clear and uncluttered, being easy to read and correct
Code		The code is ineffective or has serious errors.	The code is clean but it is not efficient or it is efficient but it is not clean or it is not well explained and structured.	The code is efficient, well detailed and structured.

### Activity 2: Trends Challenge

	Not done	Insufficient	Good	Excellent
Explanation of key aspects		The explanation is poor or does not correspond to the case study	The explanation is adequate but unclear at some point or missing some detail	The explanation is satisfactory and all the necessary concepts appear
Application of theoretical concepts		The theoretical concepts requested have not been correctly applied or have not been identified	Most theoretical concepts have been correctly identified	All theoretical concepts have been properly identified

Presentation		Memory is unclear and confusing, which sometimes makes it impossible to understand	The presentation is good but there is some part that could improve in clarity	The presentation is clear and uncluttered, being easy to read and correct
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## PLAGIARISM REGULATION

In accordance with the current student disciplinary regulations at Universidad Europea:

- Plagiarism, in full or in part, of intellectual works of any kind, is considered a very serious offense.
- Very serious offenses relating to plagiarism and the use of fraudulent means to pass assessment tests shall result in exclusion from the exams for the relevant period, as well as the inclusion of the offense and its details in the student's academic record.