# 1. BASIC INFORMATION

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|---|---|
| **Course** | APPLICATIONS AND TRENDS IN DATA SCIENCE |
| **Degree program** | DEGREE IN DATA SCIENCE |
| **School** | SCHOOL OF SCIENCE, ENGINEERING AND DESIGN |
| **Year** | 3 |
| **ECTS** | 6 |
| **Credit type** | MANDATORY |
| **Language(s)** | ENGLISH |
| **Delivery mode** | IN-PERSON |
| **Semester** | 6 |

# 2. INTRODUCTION

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. SKILLS AND LEARNING OUTCOMES

**Core competencies:**

- CB1: That students have demonstrated knowledge in an area of study that starts from the basis of general secondary education, and is usually found at a level that, although supported by advanced textbooks, also includes some aspects that imply knowledge from the forefront of their field of study
- CB2: That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study
- CB3: That students know how to apply their knowledge to their work or vocation in a professional way and possess the skills that are usually demonstrated through the elaboration and defense of arguments and the resolution of problems within their area of study

**Cross-curricular competencies:**

- CT03: Teamwork: Ability to integrate and collaborate actively with other people, areas and / or organizations to achieve common goals.
- CT05: Analysis and problem-solving: Be able to evaluate information critically, break down complex situations into their constituent parts, recognize patterns, and consider other alternatives, approaches, and perspectives to find optimal solutions and efficient negotiations.

- CT08: Entrepreneurial spirit: Ability to assume and carry out activities that generate new opportunities, anticipate problems or involve improvements.

**Specific competencies:**

- CE10. Ability to apply Big Data methodologies, architectures and techniques for effective data management.
- CE11. Ability to apply computational 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.
- CE12. Ability to describe systems interoperability and data integration and aggregation techniques.
- CE13. Ability to design efficient interfaces in the context of Big Data that guarantee accessibility and usability, using graphic and analytical representation techniques.

**Learning outcomes:**

- RA1: Describe the particularities of the different branches of data science.
- RA2: List the main problems presented by data analysis depending on their context.
- RA3: Model and evaluate different applications to solve problems encompassed in various branches of data science.
- RA4: Select optimal techniques to present solutions to specific data science problems.

The following table shows the relationship between the competencies developed during the course and the learning outcomes pursued:

| Competencies | Learning outcomes |
|---|---|
| CB1, CB2, CB3, CT8, CE12 | RA1 |
| CB3, CT03, CT05, CE10, CE11, CE13 | RA2 |
| CB2, CT03, CT08, CE11, CE12, CE13 | RA3 |
| CB2, CT03, CT08, CE11, CE12, CE13 | RA4 |

# 4. CONTENTS

The subject is organized into four learning units:

Unit 1. Natural language processing
Unit 2. Recommendation engines
Unit 3. Computer vision
Unit 4. Introduction to cases of data science trends in Industry 4.0

# 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 |
| **TOTAL** | **150** |

## 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 | 20 |
| Tests to evaluate attitudes | 5 |
| Self-assessment and co-evaluation tests | 10 |
| Laboratory, workshop or simulation practice tests | 5 |

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. First exam period

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 assessable activities (deliveries, assignments, projects, challenges, tasks, presentations, etc.) will also have a minimum grade of 4 out of 10 to average and a minimum average grade of 5 out of 10 to pass the subject.

## 7.2. Second exam period

The activities not passed in the Ordinary Call must 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.

All the marks obtained in the Extraordinary Call, except the exam, will be multiplied by a coefficient of 0.7. Those that remain approved from the Ordinary Call are not altered.

Once multiplied by 0.7, the following points should be considered:

- To pass the subject, you must obtain a grade greater than or equal to 5 out of 10 in the final grade (weighted average) of the subject.
- 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. If you have passed all the partial exams, you won't need to do the exam.
- The assessable activities (deliveries, assignments, projects, challenges, tasks, presentations, etc.) will also have a minimum grade of 4 out of 10 to average and a minimum average grade of 5 out of 10 to pass the subject.

# 8. BIBLIOGRAPHY

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.