



## GENERAL INFORMATION

Data of the subject	
Subject name	Programming Paradigms and Techniques
Subject code	DTC-IMAT-315
Main program	<a href="#">Bachelor's Degree in Mathematical Engineering and Artificial Intelligence</a>
Involved programs	Grado en Ingeniería Matemática e Inteligencia Artificial [Third year]
Credits	6,0 ECTS
Type	Obligatoria (Grado)
Department	Department of Telematics and Computer Sciences

Teacher Information	
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## DESCRIPTION OF THE SUBJECT

Contextualization of the subject
<b>Prerequisites</b>
<ul style="list-style-type: none"><li>Basic programming knowledge.</li></ul>



## Course contents

### Contents

#### 1. Introduction to Programming Paradigms

- Definition of programming paradigms
- Main paradigms: Imperative, object-oriented, functional, logical, etc.
- Advantages and disadvantages of each paradigm.
- Practical examples of applications in different paradigms.

#### 2. Introduction to Unity

- Basic Unity concepts.
- Scene and object creation in Unity.
- Scripts & Component editing.

#### 3. Object-Oriented Programming using C#

- Basic concepts of object-oriented programming (OOP).
- Classes and objects.
- Inheritance and polymorphism.
- Application of OOP in problem-solving.

#### 4. Introduction to Software Architecture

- Principles and concepts of software architecture.
- Software analysis.
- Object-oriented software design.
- Components and connectors in architecture.
- Common architectural patterns.

#### 5. Basic Language Classes and API

- Basic classes and structures.
- Basic data structures: lists, stacks, queues, etc.
- File manipulation and database access.
- Use of API.

#### 6. Design Patterns, SOLID Principles, and Clean Code

- SOLID principles (Single Responsibility, Open/Closed, Liskov Substitution, Interface Segregation, Dependency Inversion).
- Best programming practices and clean code.
- Introduction to design patterns.

#### 7. ML Agents in Unity

- Introduction to artificial intelligence and machine learning.
- Creating AI agents in Unity using ML agents.

#### 8. Introduction to Functional Programming in Python

- Basic concepts of functional programming.



- Syntax and features of functional programming in Python.
- Application of functional programming in problem-solving.

## 9. Introduction to Thread-Based Application Design and Socket Programming

- Basic concepts of threads and concurrency.
- Design and implementation of multithreaded applications.
- Introduction to socket programming for network communication.

## EVALUATION AND CRITERIA

Evaluation activities	Evaluation criteria	Weight
<b>Exams:</b> <ul style="list-style-type: none"><li>• Mid-term test.</li><li>• Final exam.</li></ul>	<b>Mid-term test (15%):</b> <ul style="list-style-type: none"><li>• The goal is to test the current knowledge of students and give them early feedback.</li><li>• It will include all elements learnt until that point (OOP, Basic paradigms, use of API, Unity knowledge...)</li></ul> <b>Final exam(45%):</b> <ul style="list-style-type: none"><li>• It will include every content given in class up until that point, including everything included in the mid-term exam.</li></ul>	60
<b>Final project</b>	Final project to be delivered in pairs at the end of the course: <ul style="list-style-type: none"><li>• The quality of the implementations, the application of the concepts learned, code organization, and the ability to work as a team will be evaluated.</li><li>• Documentation and the final presentation of the videogame will also be taken into account.</li></ul>	30
<b>Practical Sessions:</b> <ul style="list-style-type: none"><li>• Collaborative Challenges</li><li>• Non-Presential Assignments.</li><li>• Practical Exercises.</li></ul>	Attitude, participation, and completion of weekly exercises and challenges presented in collaborative and individual sessions.	10

## Grading

### Evaluation:

- 45% Final Exam
- 15% Midterm Exam



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**2024 - 2025**

- 10% Practical Assignments
- 30% Final Project

#### **Grades:**

In order to apply the weighting, a minimum grade of 5 is essential in the exam.

Missing 15% or more of the in-person hours for this subject may result in the inability to take both the regular and extraordinary exam opportunities.

## **BIBLIOGRAPHY AND RESOURCES**

### **Basic References**

**Base book used in class:** Unity Artificial Intelligence Programming - Fourth Edition. Dr. Davide Aversa , Aung Sithu Kyaw , Clifford Peters.

**Clean Code fundamentals:** Clean Code: A Handbook of Agile Software Craftsmanship 1st Edition. Robert C. Martin.

In compliance with current regulations on the **protection of personal data**, we would like to inform you that you may consult the aspects related to privacy and data [that you have accepted on your registration form](#) by entering this website and clicking on "download"

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