



GENERAL INFORMATION

Data of the subject	
Subject name	Programming Paradigms and Techniques
Subject code	DTC-IMAT-315
Main program	Bachelor's Degree in Mathematical Engineering and Artificial Intelligence
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
Prerequisites
Basic programming knowledge.

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

The use of AI to produce full assignments or substantial parts thereof, without proper citation of the source or tool used, or without explicit permission in the assignment instructions, will be considered plagiarism and therefore subject to the University's General Regulations.

Evaluation activities	Evaluation criteria	Weight
Exams: • Mid-term test. • Final exam.	Mid-term test (20%): • The goal is to test the current knowledge of students and give them early feedback. • It will include all elements learnt until that point (OOP, Basic paradigms, use of API, Unity knowledge...) Final exam(50%): • It will include every content given in class up until that point, including everything included in the mid-term exam.	70 %
Final project	Final project to be delivered in pairs at the end of the course: • The quality of the implementations, the application of the concepts learned, code organization, and the ability to work as a team will be evaluated. • Documentation and the final presentation of the videogame will also be taken into account.	20 %
Practical Sessions: • Collaborative Challenges • Non-Presential Assignments. • Practical Exercises.	Attitude, participation, and completion of weekly exercises and challenges presented in collaborative and individual sessions.	10



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Grading

Evaluation:

- 50% Final Exam
- 20% Midterm Exam
- 10% Practical Assignments
- 20% 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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