# Master's Degree
## Video Game Programming

tech global university

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# Master's Degree

## Video Game Programming

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

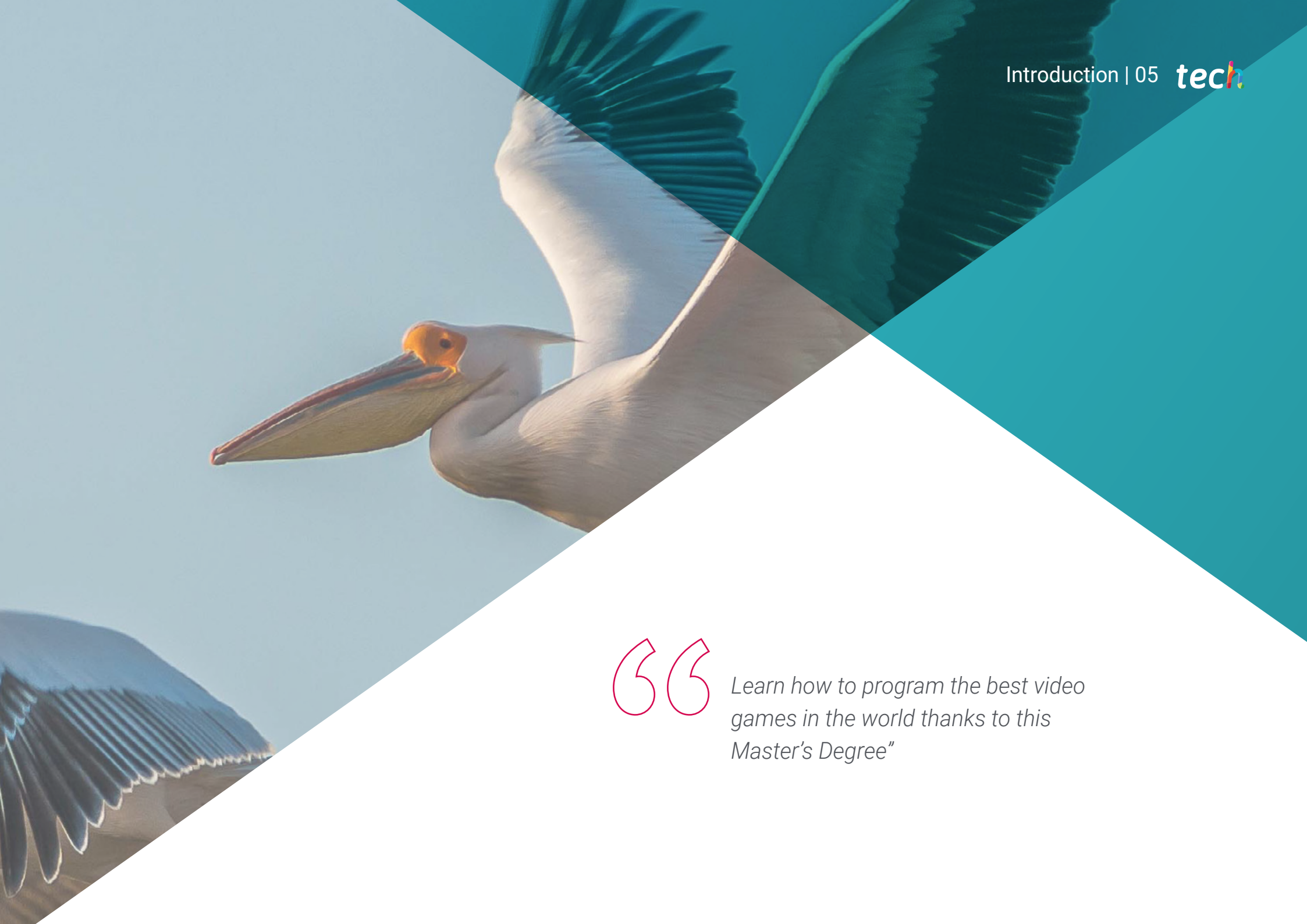
Website: www.techtitute.com/us/videogames/master-degree/master-video-game-programming

# Index

01

# Introduction

Among the most important and delicate tasks when carrying out a video game project is programming. Programming is at the core of any video game, since it is the process that creates its basic instructions and dictates its general functions. That is to say, without the code created by developers, the visual section, the story and the gameplay could not stand out in an audiovisual work of this type. This program offers its students all the knowledge to become the best programmers in the industry, so that the best companies would want to count on them to develop their projects.



*Learn how to program the best video games in the world thanks to this Master's Degree"*

The video game industry has experienced a great expansion in recent years. Given the popularity of this form of entertainment, companies in the field have been forced to design and publish games more frequently. The need for more creativity has also grown, as gamers are increasingly demanding more varied titles in different genres that offer new experiences.

For this reason, the field is demanding video game programming specialists to take on the fundamental task of creating the code for their new works. This work is delicate and requires a high level of specialization, so it is advisable to have undertaken a deep and optimal learning process to become a true expert.

This Master's Degree in Video Game Programming is what professionals need to enter development departments in large companies in the industry. Throughout the program, students will learn the basics of programming and software engineering, data structure and algorithms, object-oriented programming and other more specific issues such as game engines or real-time programming.

In this way, students are guaranteed to get the best knowledge so they can apply it directly in their areas of work.

This **Master's Degree in Video Game Programming** contains the most complete and up-to-date program on the market. The most important features include:

- Practical cases presented by experts in video game programming and development
- The graphic, schematic, and practical contents with which they are created, provide scientific and practical information on the disciplines that are essential for professional practice
- Practical exercises where self-assessment can be used to improve learning
- Its special emphasis on innovative methodologies
- Theoretical lessons, questions to the expert, debate forums on controversial topics, and individual reflection assignments
- Content that is accessible from any fixed or portable device with an Internet connection

*The best companies in the industry will want to count on you"*

*You want to develop the best video games in the world and this program teaches you how to do it"*

*Program the video games of your dreams thanks to this Master's Degree.*

*Don't wait any longer: Program video games as do the best experts.*

The program's teaching staff includes professionals from sector who contribute their work experience to this training program, as well as renowned specialists from leading societies and prestigious universities.

The multimedia content, developed with the latest educational technology, will provide the professional with situated and contextual learning, i.e., a simulated environment that will provide immersive specialization programmed to learn in real situations.

This program is designed around Problem-Based Learning, whereby the professional must try to solve the different professional practice situations that arise throughout the program. For this purpose, the student will be assisted by an innovative interactive video system created by renowned and experienced experts.

02

# Objectives

The main objective of this Master's Degree in Video Game Programming is to offer its students the best knowledge so they become the best experts in video game development in their environment. To do so, the program offers them a series of tools used in the field that will improve their work as developers and lead them to achieve all their professional goals, being able to program the best video games in the world.

*Achieve all your goals thanks to this program"*

## General Objectives

- Become familiar the different programming languages and methods used in video games
- Delve into video game production processes and integrating programming into these stages
- Learn the fundamentals of video game design and the theoretical knowledge that a video game designer should possess
- Master basic programming languages used in video games
- Apply knowledge of software engineering and specialized programming to video game development
- Understand the role of programming in video game development
- Know the different existing consoles and platforms
- Develop web and multiplayer video games



## Specific Objectives

### Module 1. Programming Fundamentals

- Understand the basic structure of computers, software and the general purpose programming languages
- Analyze the essential elements of a computer program, such as the different data types, operators, expressions, statements, I/O and control statements
- Interpret algorithms as the necessary basis to develop computer programs

### Module 2. Data Structure and Algorithms

- Learn the main algorithm design strategies, as well as the different methods and measures for algorithm computation
- Understand algorithm function, strategies and examples of the most common problems
- Understand the Backtracking technique and its main uses

### Module 3. Object Oriented Programming

- Know the different design patterns for object-oriented problems
- Understand the importance of documentation and testing in software development
- Manage the use of threading and synchronization, and solve common problems in concurrent programming

### Module 4. Consoles and Devices for Video Games

- Know the basic functioning of the main input and output peripherals
- Understand the main implications of design for different platforms
- Study the structure, organization, functioning and interconnectivity of devices and systems
- Understand the function of the operative system and the development kits for mobile devices and video game platforms

### Module 5. Software Engineering

- Become familiar with the bases of software engineering, software processes and different development models, including agile technologies
- Recognize requirements engineering, its development, elaboration, negotiation and validation in order to understand the main standards in terms of software quality and project management

### Module 6. Video Game Engines

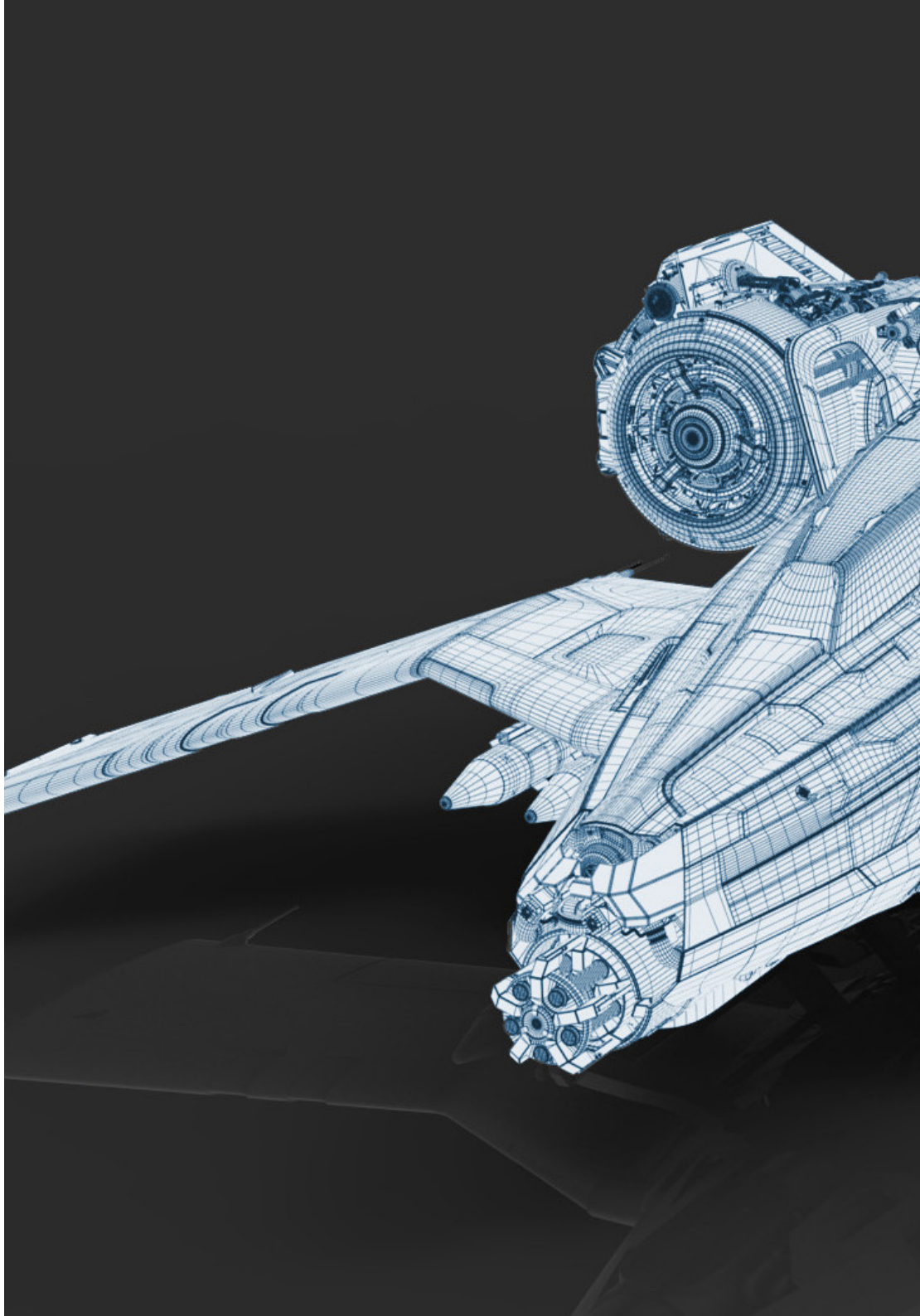
- Discover how a video game engine works and its architecture
- Understand the basic features of existing game engines
- Correctly and efficiently program applications used in video game engines
- Choose the most appropriate paradigm and programming languages to program applications used in video game engines

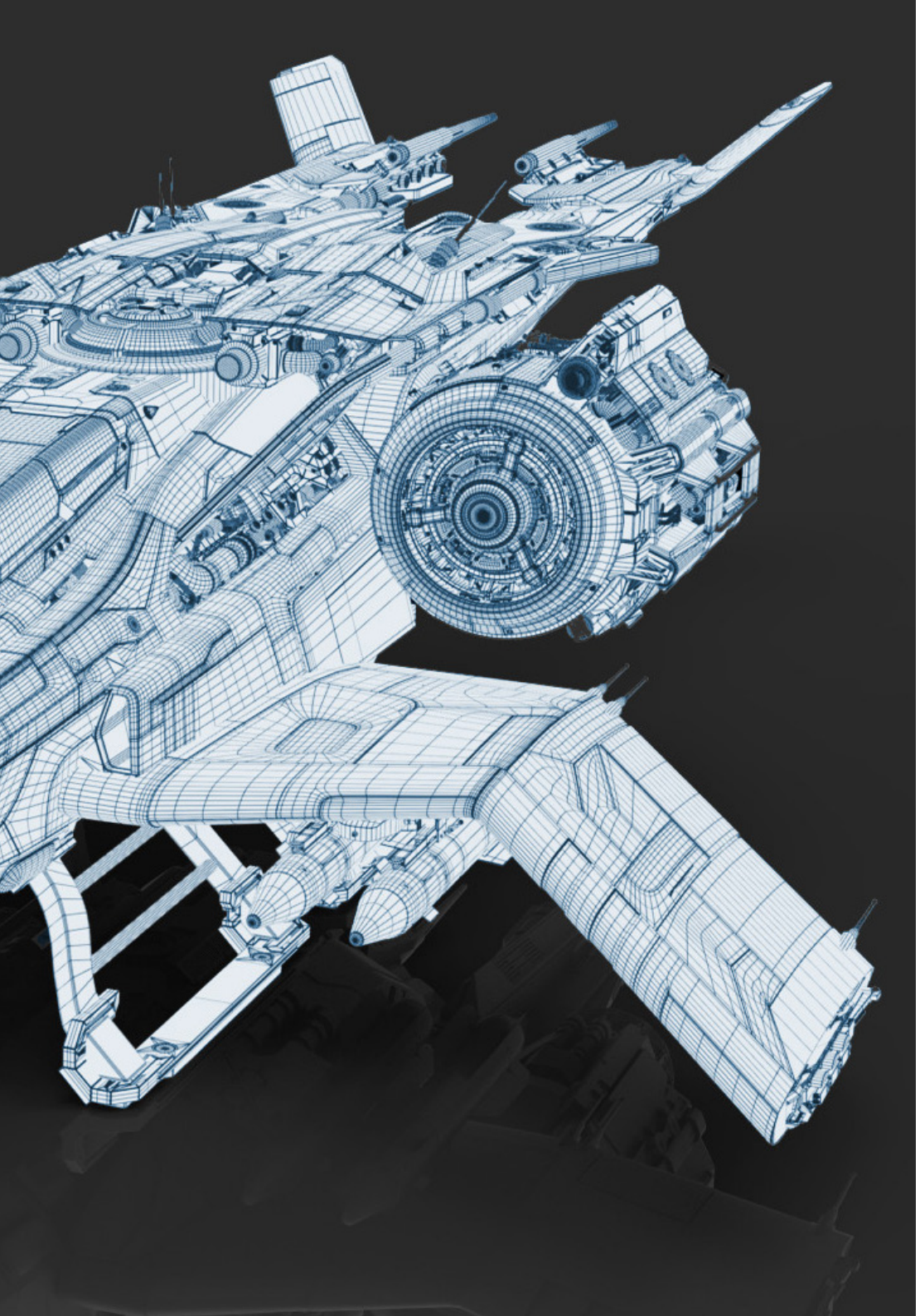
### Module 7. Intelligent Systems

- Establish agent theory concepts, agent architecture and the reasoning process behind it
- Assimilate the theory and practice behind the concepts of information and knowledge, as well as the different ways of representing knowledge
- Understand the functioning of semantic reasoners, knowledge-based systems and expert systems

### Module 8. Real-Time Programming

- Analyze the key features of real-time programming languages that differentiate them from traditional ones
- Understand the basic concepts behind computer systems
- Acquire the ability to apply the main bases and techniques in real-time programming







### Module 9. Web Game Design and Development

- Design games and interactive web applications with the corresponding documentation
- Evaluate the main features of games and interactive web applications for professional and adequate communication

### Module 10. Multiplayer Networks and Systems

- Describe the Transmission Control Protocol/Internet Protocol (TCP/IP) architecture and the basic operation of wireless networks
- Analyze video games security
- Develop multiplayer online games

*You want to get a position in the best companies in the world and this program will help you get there"*

03

# Skills

Students who enroll in this Master's Degree will obtain a series of skills that will turn them into true experts in video game development, so they can join any type of project in the industry. Students will master issues related to different specific programming languages used in this type of audiovisual products, as well as transversal skills they should know, such as in the field of consoles and platforms and game engines.

*You will have all the knowledge necessary to develop outstanding video games"*

## General Skills

- Design all the phases in developing a video game, from start to the final launch
- Specialize as a video game programmer
- Delve into all the developmental stages, from the initial architecture and player-character programming to every element involved in the game process
- Obtain an overall vision of the project, being able to provide solutions to the different problems and challenges that arise in the design of a video game

*Master all kinds of programming languages used in video games with this Master's Degree"*



## Specific Skills

- Know the necessary software to be a professional video game developer
- Understand the player's experience and know how to analyze gameplay
- Understand all the theoretical and practical procedures involved in video game programming processes
- Master the most useful programming languages used in the video game world
- Integrate the programming learned to different types of consoles and platforms
- Program web and multiplayer video games
- Assimilate the concept of a video game engine for correct programming
- Apply knowledge of software engineering to video game programming

04

# Structure and Content

This Master's Degree in Video Game Programming offers its students the best content in video game development, thanks to its careful design, structured in 10 modules of 10 topics each. Through them, students will learn everything they need to participate in any kind of video game project, so that their educational process is complete, comprehensive and totally focused on practice.

*The contents you need to specialize in video game programming"*

## **Module 1.** Programming Fundamentals

1.1. Introduction to Programming
- 1.1.1. Basic Computer Structure
- 1.1.2. Software
- 1.1.3. Programming Languages
- 1.1.4. Computer Application Life Cycle

1.2. Algorithm Design
- 1.2.1. Problem Solving
- 1.2.2. Descriptive Techniques
- 1.2.3. Algorithm Elements and Structure

1.3. Program Elements
- 1.3.1. C++ Origin and Features
- 1.3.2. Development Environment
- 1.3.3. Concept of Program
- 1.3.4. Types of Fundamental Data
- 1.3.5. Operators
- 1.3.6. Expressions
- 1.3.7. Statements
- 1.3.8. Data Input and Output

1.4. Control Statements
- 1.4.1. Statements
- 1.4.2. Branches
- 1.4.3. Loops

1.5. Abstraction and Modularity: Functions
- 1.5.1. Modular Design
- 1.5.2. Concept of Function and Utility
- 1.5.3. Definition of Function
- 1.5.4. Execution Flow When Function Is Called
- 1.5.5. Function Prototypes
- 1.5.6. Results Return
- 1.5.7. Calling Functions: Parameters
- 1.5.8. Parameter Passing According to Reference and Value
- 1.5.9. Scope Identifier

1.6. Statistical Data Structures
- 1.6.1. Arrays
- 1.6.2. Matrices Polyhedra
- 1.6.3. Searching and Sorting
- 1.6.4. Chaining: I/O Functions for Chains
- 1.6.5. Structures: Unions
- 1.6.6. New Types of Data

1.7. Dynamic Data Structures: Pointers
- 1.7.1. Concept: Definition of Pointer
- 1.7.2. Pointer Operators and Operations
- 1.7.3. Pointer Arrays
- 1.7.4. Pointers and Arrays
- 1.7.5. Chain Pointers
- 1.7.6. Structure Pointers
- 1.7.7. Multiple Indirection
- 1.7.8. Function Pointers
- 1.7.9. Function, Structure and Array as Function Parameters

1.8. Files
- 1.8.1. Basic Concepts
- 1.8.2. File Operations
- 1.8.3. Types of Files
- 1.8.4. File Organization
- 1.8.5. Introduction to C++ Files
- 1.8.6. Managing Files

1.9. Recursion
- 1.9.1. Definition of Recursion
- 1.9.2. Types of Recursion
- 1.9.3. Advantages and Disadvantages
- 1.9.4. Considerations
- 1.9.5. Recursive-Iterative Conversion
- 1.9.6. Recursion Stack



1.10. Testing and Documentation
- 1.10.1. Program Testing
- 1.10.2. White Box Testing
- 1.10.3. Black Box Testing
- 1.10.4. Testing Tools
- 1.10.5. Program Documentation

## **Module 2.** Data Structure and Algorithms

2.1. Introduction to Algorithm Design Strategies
- 2.1.1. Recursion
- 2.1.2. Divide and Conquer
- 2.1.3. Other Strategies

2.2. Algorithm Efficiency and Analysis
- 2.2.1. Efficiency Measures
- 2.2.2. Measuring Entry Size
- 2.2.3. Measuring Execution Time
- 2.2.4. Worst, Best and Average Case
- 2.2.5. Asymptotic Notation
- 2.2.6. Mathematical Analysis Criteria for Non-Recursive Algorithms
- 2.2.7. Mathematical Analysis for Recursive Algorithms
- 2.2.8. Empirical Analysis for Algorithms

2.3. Sorting Algorithms
- 2.3.1. Concept of Sorting
- 2.3.2. Bubble Sorting
- 2.3.3. Selection Sorting
- 2.3.4. Insertion Sorting
- 2.3.5. Mixed Sorting (Merge_Sort)
- 2.3.6. Quick Sorting (Quick_Sort)

2.4. Tree Algorithms
- 2.4.1. Concept of Tree
- 2.4.2. Binary Trees
- 2.4.3. Tree Traversal
- 2.4.4. Representing Expressions
- 2.4.5. Sorted Binary Trees
- 2.4.6. Balanced Binary Trees

2.5. Algorithms Using Heaps
- 2.5.1. Heaps
- 2.5.2. The Heapsort Algorithm
- 2.5.3. Priority Queues

2.6. Graph Algorithms
- 2.6.1. Representation
- 2.6.2. Width Traversal
- 2.6.3. Depth Traversal
- 2.6.4. Topological Sorting

2.7. Greedy Algorithms
- 2.7.1. Greedy Strategy
- 2.7.2. Greedy Strategy Elements
- 2.7.3. Currency Exchange
- 2.7.4. Traveling Salesman Problem
- 2.7.5. Knapsack Problem

2.8. Minimal Pathways Search
- 2.8.1. Shortest Path Problem
- 2.8.2. Cycles and Negative Arcs
- 2.8.3. Dijkstra's Algorithm

2.9. Greedy Algorithms on Graphs
- 2.9.1. Minimum Spanning Tree
- 2.9.2. Prim's Algorithm
- 2.9.3. Kruskal's Algorithm
- 2.9.4. Complexity Analysis

2.10. Backtracking
- 2.10.1. Backtracking
- 2.10.2. Alternative Techniques

## **Module 3.** Object Oriented Programming

3.1. Introduction to Object Oriented Programming
- 3.1.1. Introduction to Object Oriented Programming
- 3.1.2. Class Design
- 3.1.3. Introduction to Unified Modeling Language (UML) for Problem Modeling

3.2. Class Relations
- 3.2.1. Abstractions and Heritage
- 3.2.2. Advanced Concepts of Heritage
- 3.2.3. Polymorphism
- 3.2.4. Composition and Aggregation

3.3. Introduction to Design Patterns for Object Oriented Problems
- 3.3.1. What Are Design Patterns?
- 3.3.2. Factory Pattern
- 3.3.3. Singleton Pattern
- 3.3.4. Observer Pattern
- 3.3.5. Composite Pattern

3.4. Exceptions
- 3.4.1. What Are Exceptions?
- 3.4.2. Catching and Handling Exceptions
- 3.4.3. Launching Exceptions
- 3.4.4. Creating Exceptions

3.5. User Interface
- 3.5.1. Introduction to Qt
- 3.5.2. Positioning
- 3.5.3. What Are Events?
- 3.5.4. Events: Definition and Catching
- 3.5.5. User Interface Development

3.6. Introduction to Concurrent Programming
- 3.6.1. Introduction to Concurrent Programming
- 3.6.2. Concept of Process and Thread
- 3.6.3. Process and Thread Interaction
- 3.6.4. C++ Threads
- 3.6.5. Advantages and Disadvantages of Concurrent Programming

3.7. Thread Management and Synchronization
- 3.7.1. Thread Life Cycle
- 3.7.2. Thread Class
- 3.7.3. Thread Planning
- 3.7.4. Thread Groups
- 3.7.5. Daemon Threads
- 3.7.6. Synchronization
- 3.7.7. Locking Mechanisms
- 3.7.8. Communication Mechanisms
- 3.7.9. Monitors

3.8. Common Problems in Concurrent Programming
- 3.8.1. Producer-Consumer Problem
- 3.8.2. Readers-Writers Problem
- 3.8.3. Dining Philosophers Problem

3.9. Software Testing and Documentation
- 3.9.1. Why Is It Important to Document Software?
- 3.9.2. Design Documentation
- 3.9.3. Documentation Tool Use

3.10. Software Tests
- 3.10.1. Introduction to Software Tests
- 3.10.2. Types of Tests
- 3.10.3. Unit Test
- 3.10.4. Integration Test
- 3.10.5. Validation Test
- 3.10.6. System Test

## **Module 4.** Consoles and Devices for Videogames

4.1. History of Programming in Video Games
- 4.1.1. Atari (1977-1985)
- 4.1.2. Nintendo and Super Nintendo Entertainment Systems (NES and SNES) (1985-1995)
- 4.1.3. PlaysStation/PlayStation 2 (1995-2005)
- 4.1.4. Xbox 360, PlayStation 3 and Nintendo Wii (2005-2013)
- 4.1.5. Xbox One, PlayStation 4 and Nintendo Wii U - Switch (2013-present)
- 4.1.6. The Future

4.2. History of Gameplay in Video Games
- 4.2.1. Introduction
- 4.2.2. The Social Context
- 4.2.3. Structural Diagram
- 4.2.4. Future

4.3. Adapting to Modern Times
- 4.3.1. Games Based on Movement
- 4.3.2. Virtual Reality
- 4.3.3. Augmented Reality
- 4.3.4. Mixed Reality

4.4. Unity: Scripting I and Examples
- 4.4.1. What Is a Script?
- 4.4.2. First Script
- 4.4.3. Adding a Script
- 4.4.4. Opening a Script
- 4.4.5. MonoBehavior
- 4.4.6. Debugging

4.5. Unity: Scripting II and Examples
- 4.5.1. Keyboard and Mouse Input
- 4.5.2. Raycast
- 4.5.3. Installation
- 4.5.4. Variables:
- 4.5.5. Public and Serialized Variables

4.6. Unity: Scripting III and Examples
- 4.6.1. Obtaining Components
- 4.6.2. Modifying Components
- 4.6.3. Testing
- 4.6.4. Multiple Objects
- 4.6.5. Colliders and Triggers
- 4.6.6. Quaternions

4.7. Peripherals
- 4.7.1. Evolution and Classification
- 4.7.2. Peripherals and Interfaces
- 4.7.3. Current Peripherals
- 4.7.4. Near Future

4.8. Video Games: Future Perspectives
- 4.8.1. Games Based in the Cloud
- 4.8.2. Absence of Controllers
- 4.8.3. Immersive Reality
- 4.8.4. Other Alternatives

4.9. Architecture
- 4.9.1. Special Needs in Video Games
- 4.9.2. Evolution of Architecture
- 4.9.3. Current Architecture
- 4.9.4. Differences Between Architecture

4.10. Development Kits and Their Evolution
- 4.10.1. Introduction
- 4.10.2. Third Generation of Development Kits
- 4.10.3. Fourth Generation of Development Kits
- 4.10.4. Fifth Generation of Development Kits
- 4.10.5. Sixth Generation of Development Kits

## **Module 5.** Software Engineering

5.1. Introduction to Software Engineering and Modeling
- 5.1.1. The Nature of Software
- 5.1.2. The Unique Nature of Webapps
- 5.1.3. Software Engineering
- 5.1.4. The Software Process
- 5.1.5. Software Engineering Practice
- 5.1.6. Software Myths
- 5.1.7. How Does It All Begin?
- 5.1.8. Object-Oriented Concepts
- 5.1.9. Introduction to UML

5.2. The Software Process
- 5.2.1. A General Process Model
- 5.2.2. Prescriptive Process Models
- 5.2.3. Specialized Process Models
- 5.2.4. The Unified Process
- 5.2.5. Personal and Team Process Models
- 5.2.6. What is Agility?
- 5.2.7. What is an Agile Process?
- 5.2.8. Scrum
- 5.2.9. Agile Process Toolkit

5.3. Principles Guiding Software Engineering Practice
- 5.3.1. Principles Guiding the Process
- 5.3.2. Principles Guiding the Practice
- 5.3.3. Principles of Communication
- 5.3.4. Planning Principles
- 5.3.5. Modeling Principles
- 5.3.6. Construction Principles
- 5.3.7. Deployment Principles

5.4. Understanding the Requirements
- 5.4.1. Requirements Engineering
- 5.4.2. Establish the Basis
- 5.4.3. Inquiry of Requirements
- 5.4.4. Development of Cases Studies
- 5.4.5. Elaboration of the Requirements Model
- 5.4.6. Negotiation of Requirements
- 5.4.7. Validation of Requirements

5.5. Requirements Modeling: Scenarios, Information and Analysis Classes
- 5.5.1. Analysis of Requirements
- 5.5.2. Scenario-Based Modeling
- 5.5.3. UML Models that provide the Case Study
- 5.5.4. Data Modeling Concepts
- 5.5.5. Class-Based Modeling
- 5.5.6. Class Diagrams

5.6. Requirements Modeling: Flow, Behavior and Patterns
- 5.6.1. Requirements that Shape Strategies
- 5.6.2. Flow-Oriented Modeling
- 5.6.3. Status Diagrams
- 5.6.4. Creation of a Behavioral Model
- 5.6.5. Sequence Diagrams
- 5.6.6. Communication Diagrams
- 5.6.7. Patterns for Requirements Modeling

5.7. Design Concepts
- 5.7.1. Design in the Software Engineering Context
- 5.7.2. The Design Process
- 5.7.3. Design Concepts
- 5.7.4. Object-Oriented Design Concepts
- 5.7.5. Model of the Design

5.8. Designing the Architecture:
- 5.8.1. Software Architecture
- 5.8.2. Architectural Genres
- 5.8.3. Architectural Styles
- 5.8.4. Architectural Design
- 5.8.5. Evolution of Alternative Designs for Architecture
- 5.8.6. Mapping the Architecture Using the Data Flow

5.9. Component-Level and Pattern-Based Design
- 5.9.1. What is a Component?
- 5.9.2. Class-Based Component Design
- 5.9.3. Realization of the Design at the Component Level
- 5.9.4. Design of Traditional Components
- 5.9.5. Component-Based Development
- 5.9.6. Design Patterns
- 5.9.7. Pattern-Based Software Design
- 5.9.8. Architectural Patterns
- 5.9.9. Design Patterns at the Component Level
- 5.9.10. User Interface Design Patterns

5.10. Software Quality and Project Management
- 5.10.1. Quality
- 5.10.2. Software Quality
- 5.10.3. The Software Quality Dilemma
- 5.10.4. Achieving Software Quality
- 5.10.5. Software Quality Assurance
- 5.10.6. The Administrative Spectrum
- 5.10.7. The Staff
- 5.10.8. The Product
- 5.10.9. The Process
- 5.10.10. The Project
- 5.10.11. Principles and Practices

## **Module 6.** Video Game Engines

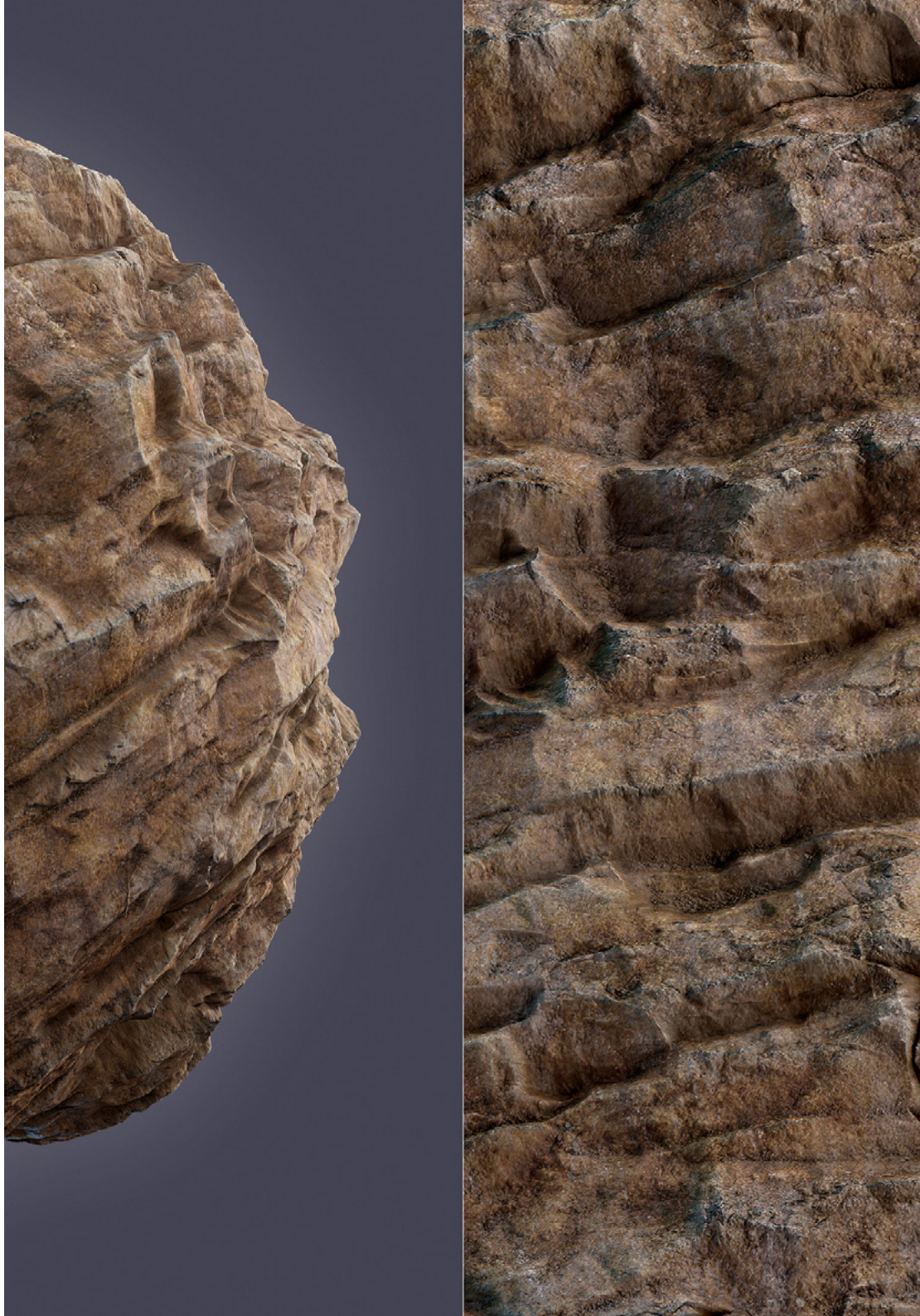
6.1. Video Games and Information Communication Technologies (ICTs)
- 6.1.1. Introduction
- 6.1.2. Opportunities
- 6.1.3. Challenges
- 6.1.4. Conclusions

6.2. History of Video Game Engines
- 6.2.1. Introduction
- 6.2.2. Atari
- 6.2.3. The 80s
- 6.2.4. First Engines: The 90s
- 6.2.5. Current Engines

6.3. Video Game Engines
- 6.3.1. Types of Engines
- 6.3.2. Video Game Engine Parts
- 6.3.3. Current Engines
- 6.3.4. Selecting an Engine

6.4. Motor Game Maker
- 6.4.1. Introduction
- 6.4.2. Scenario Design
- 6.4.3. Sprites and Animations
- 6.4.4. Collisions
- 6.4.5. Scripting in Game Maker Languages (GML)

6.5. Unreal Engine 4: Introduction
- 6.5.1. What Is Unreal Engine 4? What Is Its Philosophy?
- 6.5.2. Materials
- 6.5.3. UI
- 6.5.4. Animations
- 6.5.5. Particle Systems
- 6.5.6. Artificial Intelligence
- 6.5.7. Frames Per Second (FPS)



6.6. Unreal Engine 4: Visual Scripting
- 6.6.1. Blueprints and Visual Scripting Philosophy
- 6.6.2. Debugging
- 6.6.3. Types of Variables
- 6.6.4. Basic Flow Control

6.7. Unity 5 Engine
- 6.7.1. C# y Visual Studio Programming
- 6.7.2. Creating Prefabs
- 6.7.3. Using Gizmos to Control Video Games
- 6.7.4. Adaptive Engine: 2D and 3D

6.8. Godot Engine
- 6.8.1. Godot Design Philosophy
- 6.8.2. Object-Oriented Design and Composition
- 6.8.3. All in One Package
- 6.8.4. Open and Community-Driven Software

6.9. RPG Maker Engine
- 6.9.1. RPG Maker Philosophy
- 6.9.2. Taking as a Reference
- 6.9.3. Creating a Game with Personality
- 6.9.4. Commercially Successful Games

6.10. Source 2 Engine
- 6.10.1. Source 2 Philosophy
- 6.10.2. Source and Source 2: Evolution
- 6.10.3. Community Use: Audiovisual Content and Video Games
- 6.10.4. Future of Source 2 Engine
- 6.10.5. Successful Mods and Games

## **Module 7.** Intelligent Systems

7.1. Agents Theory
- 7.1.1. Concept History
- 7.1.2. Agent Definition
- 7.1.3. Agents in Artificial Intelligence
- 7.1.4. Agents in Software Engineering

7.2. Agent Architectures
- 7.2.1. Agent Thought Process
- 7.2.2. Reactive Agents
- 7.2.3. Deductive Agents
- 7.2.4. Hybrid Agents
- 7.2.5. Comparison

7.3. Information and Knowledge
- 7.3.1. Difference between Data, Information and Knowledge
- 7.3.2. Data Quality Assessment
- 7.3.3. Data Collection Methods
- 7.3.4. Information Acquisition Methods
- 7.3.5. Knowledge Acquisition Methods

7.4. Knowledge Representation
- 7.4.1. The Importance of Knowledge Representation
- 7.4.2. Definition of Knowledge Representation According to Role
- 7.4.3. Knowledge Representation Features

7.5. Ontologies
- 7.5.1. Introduction to Metadata
- 7.5.2. Philosophical Concept of Ontology
- 7.5.3. Computing Concept of Ontology
- 7.5.4. Domain Ontologies and Higher-Level Ontologies
- 7.5.5. Building an Ontology?

7.6. Ontology Languages and Ontology Creation Software
- 7.6.1. Triple RDF, Turtle and N3
- 7.6.2. RDF Schema
- 7.6.3. OWL
- 7.6.4. SPARQL
- 7.6.5. Introduction to Ontology Creation Tools
- 7.6.6. Installing and Using Protégé

7.7. Semantic Web
- 7.7.1. Current and Future Status of Semantic Web
- 7.7.2. Semantic Web Applications

7.8. Other Knowledge Representation Models
- 7.8.1. Vocabulary
- 7.8.2. Global Vision
- 7.8.3. Taxonomy
- 7.8.4. Thesauri
- 7.8.5. Folksonomy
- 7.8.6. Comparison
- 7.8.7. Mind Maps

7.9. Knowledge Representation Assessment and Integration
- 7.9.1. Zeroth-Order Logic
- 7.9.2. First-Order Logic
- 7.9.3. Description Logic
- 7.9.4. Relation between Different Types of Logic
- 7.9.5. Prolog: Programming Based on First-Order Logic

7.10. Semantic Reasoners, Knowledge-Based Systems and Expert Systems
- 7.10.1. Concept of Reasoner
- 7.10.2. Reasoner Applications
- 7.10.3. Knowledge-Based Systems
- 7.10.4. MYCIN: History of Expert Systems
- 7.10.5. Expert Systems Elements and Architecture
- 7.10.6. Creating Expert Systems

## **Module 8.** Real-Time Programming

8.1. Basic Concepts in Concurrent Programming
- 8.1.1. Fundamental Concepts
- 8.1.2. Concurrency
- 8.1.3. Benefits of Concurrency
- 8.1.4. Concurrency and Hardware

8.2. Basic Concurrency Support Structures in Java
- 8.2.1. Concurrency in Java
- 8.2.2. Creating Threads
- 8.2.3. Methods
- 8.2.4. Synchronization

8.3. Threads, Life Cycles, Priorities, Interruptions, Status and Executers
- 8.3.1. Threads
- 8.3.2. Life Cycle
- 8.3.3. Priorities
- 8.3.4. Interruptions
- 8.3.5. Status
- 8.3.6. Executers

8.4. Mutual Exclusion
- 8.4.1. What Is Mutual Exclusion?
- 8.4.2. Dekker's Algorithm
- 8.4.3. Peterson's Algorithm
- 8.4.4. Mutual Exclusion in Java

8.5. Status Dependency
- 8.5.1. Dependency Injections
- 8.5.2. Pattern Implementation in Java
- 8.5.3. Ways to Inject Dependencies
- 8.5.4. Example

8.6. Design Patterns
- 8.6.1. Introduction
- 8.6.2. Creation Patterns
- 8.6.3. Structure Patterns
- 8.6.4. Behavioral Patterns

8.7. Using Java Libraries
- 8.7.1. What Are Java Libraries?
- 8.7.2. Mockito-All, Mockito-Core
- 8.7.3. Guava
- 8.7.4. Commons-io
- 8.7.5. Commons-lang, Commons-lang3

8.8. Shader Programming
- 8.8.1. Pipeline 3D and Rasterized
- 8.8.2. Vertex Shading
- 8.8.3. Pixel Shading: Lighting I
- 8.8.4. Pixel Shading: Lighting II
- 8.8.5. Post-Effects

8.9. Real-Time Programming
- 8.9.1. Introduction
- 8.9.2. Processing Interruptions
- 8.9.3. Synchronization and Communication between Processes
- 8.9.4. Real-Time Planning Systems

8.10. Real-Time Planning
- 8.10.1. Concepts
- 8.10.2. Real-Time Systems Reference Model
- 8.10.3. Planning Policies
- 8.10.4. Cyclical Planners
- 8.10.5. Statistical Property Planners
- 8.10.6. Dynamic Property Planners

## **Module 9.** Web Game Design and Development

9.1. Web Origins and Standards
- 9.1.1. The Origin of the Internet
- 9.1.2. The Creation of the World Wide Web
- 9.1.3. First Web Standards
- 9.1.4. The Rise of Web Standards

9.2. HTTP and Client-Server Structure
- 9.2.1. Client-Server Role
- 9.2.2. Client-Server Communication
- 9.2.3. Recent History
- 9.2.4. Centralized Computing

9.3. Web Programming: Introduction
- 9.3.1. Basic Concepts
- 9.3.2. Preparing Web Servers
- 9.3.3. Basic Concepts of HTML5
- 9.3.4. HTML Forms

9.4. Introduction to HTML and Exapmles
- 9.4.1. HTML5 History
- 9.4.2. HTML5 Elements
- 9.4.3. Application Programming Interface (API)
- 9.4.4. CCS3

9.5. Document Object Model
- 9.5.1. What Is a Document Object Model?
- 9.5.2. Using DOCTYPE
- 9.5.3. The Importance of Validating the HTML
- 9.5.4. Accessing Elements
- 9.5.5. Creating Elements and Texts
- 9.5.6. Using innerHTML
- 9.5.7. Deleting an Element or Text Node
- 9.5.8. Reading and Writing Element Attributes
- 9.5.9. Manipulating Element Styles
- 9.5.10. Attaching Multiple Files at Once

9.6. Introduction to CSS and Examples
- 9.6.1. CSS3 Syntax
- 9.6.2. Style Sheets
- 9.6.3. Labels
- 9.6.4. Selectors
- 9.6.5. CSS Web Design

9.7. Introduction to JavaScript and Examples
- 9.7.1. What Is JavaScript?
- 9.7.2. A Brief History of the Language
- 9.7.3. Versions of JavaScript
- 9.7.4. Displaying Dialog Boxes
- 9.7.5. JavaScript Syntax
- 9.7.6. Understanding Scripts
- 9.7.7. Spaces
- 9.7.8. Comments
- 9.7.9. Functions
- 9.7.10. On-Page and External JavaScript

9.8. JavaScript Functions
- 9.8.1. Function Declaration
- 9.8.2. Function Expression
- 9.8.3. Calling Functions
- 9.8.4. Recursion
- 9.8.5. Nested Functions and Closures
- 9.8.6. Variable Preservation
- 9.8.7. Multiple Nested Functions
- 9.8.8. Name Conflicts
- 9.8.9. Closings or Closures
- 9.8.10. Function Parameters

9.9. PlayCanvas for Web Game Development
- 9.9.1. What Is PlayCanvas?
- 9.9.2. Project Configuration
- 9.9.3. Creating an Object
- 9.9.4. Adding Physics
- 9.9.5. Adding Models
- 9.9.6. Changing the Gravity and Scene Settings
- 9.9.7. Executing Scripts
- 9.9.8. Camera Control

9.10. Phaser for Web Game Development
- 9.10.1. What Is Phaser?
- 9.10.2. Loading Resources
- 9.10.3. Building the World
- 9.10.4. Platforms
- 9.10.5. Players
- 9.10.6. Adding Physics
- 9.10.7. Using the Keyboard
- 9.10.8. Pickups
- 9.10.9. Points and Scoring
- 9.10.10. Bouncing Bombs

## **Module 10.** Multiplayer Networks and Systems

10.1. History and Evolution of Multiplayer Video Games
- 10.1.1. The 1970s: First Multiplayer Games
- 10.1.2. The 90s: Duke Nukem, Doom and Quake
- 10.1.3. The Rise of Multiplayer Video Games
- 10.1.4. Local or Online Multiplayer
- 10.1.5. Party Games

10.2. Multiplayer Business Models
- 10.2.1. Origin and Function of Emerging Business Models
- 10.2.2. Online Sales Services
- 10.2.3. Free to Play
- 10.2.4. Micropayments
- 10.2.5. Advertising
- 10.2.6. Monthly Payment Subscription
- 10.2.7. Pay to Play
- 10.2.8. Try before You Buy

10.3. Local and Network Games
- 10.3.1. Local Games: Beginnings
- 10.3.2. Party Games: Nintendo and Family Union
- 10.3.3. Networks Games: Beginnings
- 10.3.4. Network Games Evolution

10.4. OSI Model: Layers I
- 10.4.1. OSI Model: Introduction
- 10.4.2. Physical Layer
- 10.4.3. Data Link Layer
- 10.4.4. Network Layer

10.5. OSI Model: Layers II
- 10.5.1. Transport Layer
- 10.5.2. Session Layer
- 10.5.3. Presentation Layer
- 10.5.4. Application Layer

10.6. Computer Networks on the Internet
- 10.6.1. What Are Computer Networks?
- 10.6.2. Software
- 10.6.3. Hardware
- 10.6.4. Servers
- 10.6.5. Network Storage
- 10.6.6. Network Protocols

10.7. Mobile and Wireless Networks
- 10.7.1. Mobile Networks
- 10.7.2. Wireless Networks
- 10.7.3. How Mobile Networks Work
- 10.7.4. Digital Technology

10.8. Security
- 10.8.1. Personal Security
- 10.8.2. Video Game Hacks and Cheats
- 10.8.3. Anti-Cheating Security
- 10.8.4. Anti-Cheating Security Systems Analysis

10.9. Multiplayer Systems: Servers
- 10.9.1. Server Hosting
- 10.9.2. Massively Multiplayer Online (MMO) Video Games
- 10.9.3. Dedicated Video Game Servers
- 10.9.4. Local Area Network (LAN) Parties

10.10. Multiplayer Video Game Design and Programming
- 10.10.1. Multiplayer Video Game Design Basics in Unreal
- 10.10.2. Multiplayer Video Game Design Basics in Unity
- 10.10.3. How to Make a Multiplayer Game Fun
- 10.10.4. Beyond the Controller: Multiplayer Controller Innovation

05

# Methodology

This academic program offers students a different way of learning. Our methodology uses a cyclical learning approach: **Relearning**.

This teaching system is used, for example, in the most prestigious medical schools in the world, and major publications such as the **New England Journal of Medicine** have considered it to be one of the most effective.

*Discover Relearning, a system that abandons conventional linear learning, to take you through cyclical teaching systems: a way of learning that has proven to be extremely effective, especially in subjects that require memorization"*

## Case Study to contextualize all content

Our program offers a revolutionary approach to developing skills and knowledge. Our goal is to strengthen skills in a changing, competitive, and highly demanding environment.

*At TECH, you will experience a learning methodology that is shaking the foundations of traditional universities around the world"*


*You will have access to a learning system based on repetition, with natural and progressive teaching throughout the entire syllabus.*

*The student will learn to solve complex situations in real business environments through collaborative activities and real cases.*

## A learning method that is different and innovative

This TECH program is an intensive educational program, created from scratch, which presents the most demanding challenges and decisions in this field, both nationally and internationally. This methodology promotes personal and professional growth, representing a significant step towards success. The case method, a technique that lays the foundation for this content, ensures that the most current economic, social and professional reality is taken into account.

> *Our program prepares you to face new challenges in uncertain environments and achieve success in your career"*

The case method has been the most widely used learning system among the world's leading business schools for as long as they have existed. The case method was developed in 1912 so that law students would not only learn the law based on theoretical content. It consisted of presenting students with real-life, complex situations for them to make informed decisions and value judgments on how to resolve them. In 1924, Harvard adopted it as a standard teaching method.

What should a professional do in a given situation? This is the question that you are presented with in the case method, an action-oriented learning method. Over the course of 4 years, you will be presented with multiple practical case studies. You will have to combine all your knowledge, and research, argue, and defend your ideas and decisions.

## Relearning Methodology

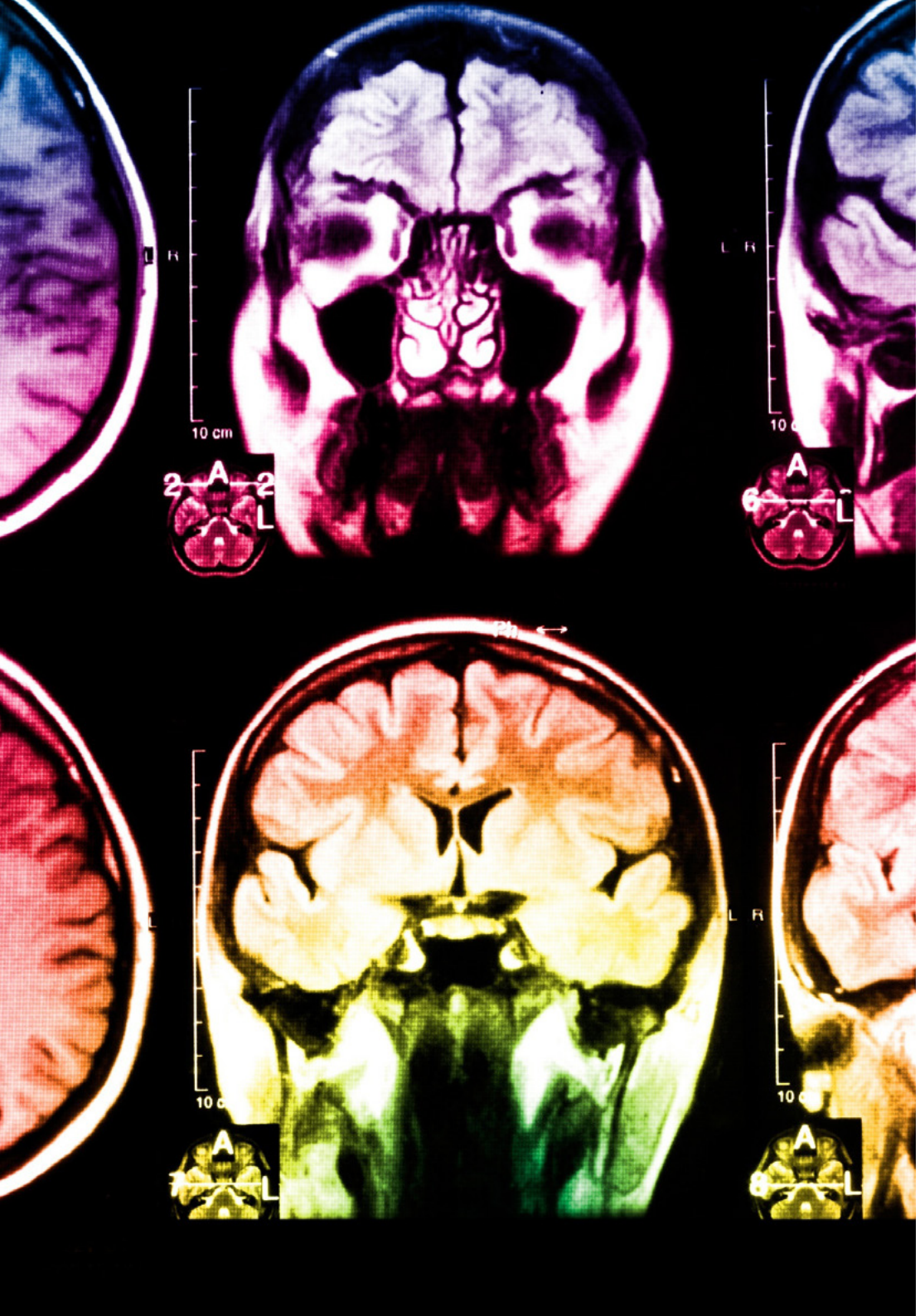
TECH effectively combines the Case Study methodology with a 100% online learning system based on repetition, which combines 8 different teaching elements in each lesson.

We enhance the Case Study with the best 100% online teaching method: Relearning.

*In 2019, we obtained the best learning results of all online universities in the world.*

At TECH you will learn using a cutting-edge methodology designed to train the executives of the future. This method, at the forefront of international teaching, is called Relearning.

Our university is the only one in the world authorized to employ this successful method. In 2019, we managed to improve our students' overall satisfaction levels (teaching quality, quality of materials, course structure, objectives...) based on the best online university indicators.



In our program, learning is not a linear process, but rather a spiral (learn, unlearn, forget, and re-learn). Therefore, we combine each of these elements concentrically. This methodology has trained more than 650,000 university graduates with unprecedented success in fields as diverse as biochemistry, genetics, surgery, international law, management skills, sports science, philosophy, law, engineering, journalism, history, and financial markets and instruments. All this in a highly demanding environment, where the students have a strong socio-economic profile and an average age of 43.5 years.

*Relearning will allow you to learn with less effort and better performance, involving you more in your training, developing a critical mindset, defending arguments, and contrasting opinions: a direct equation for success.*

From the latest scientific evidence in the field of neuroscience, not only do we know how to organize information, ideas, images and memories, but we know that the place and context where we have learned something is fundamental for us to be able to remember it and store it in the hippocampus, to retain it in our long-term memory.

In this way, and in what is called neurocognitive context-dependent e-learning, the different elements in our program are connected to the context where the individual carries out their professional activity.

**This program offers the best educational material, prepared with professionals in mind:**

### Study Material

All teaching material is produced by the specialists who teach the course, specifically for the course, so that the teaching content is highly specific and precise.

These contents are then applied to the audiovisual format, to create the TECH online working method. All this, with the latest techniques that offer high quality pieces in each and every one of the materials that are made available to the student.

### Classes

There is scientific evidence suggesting that observing third-party experts can be useful.

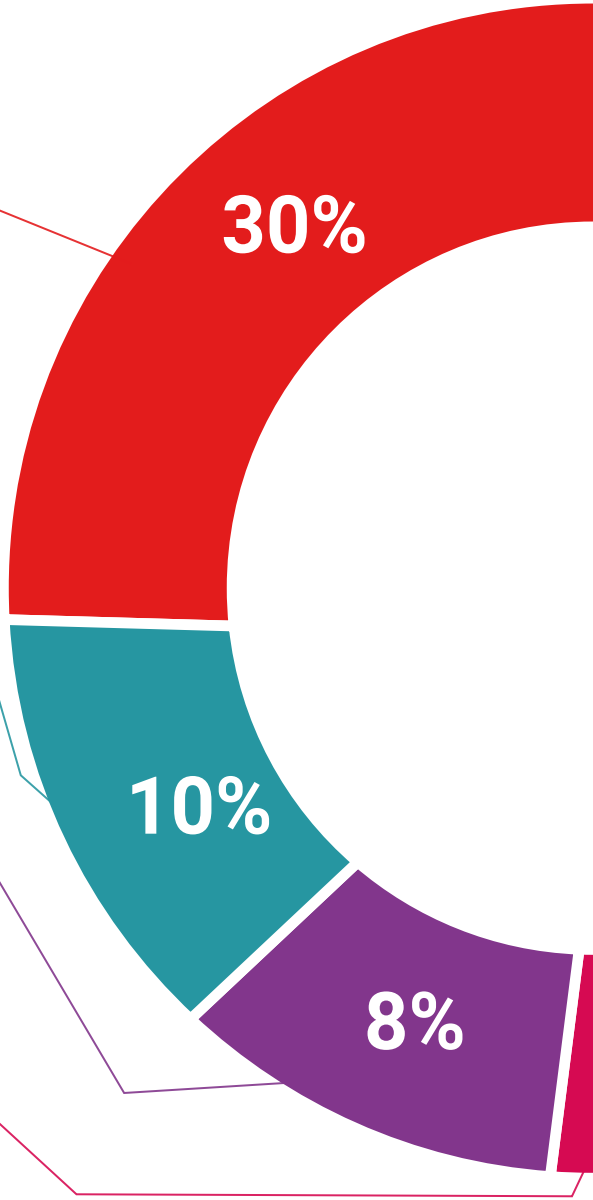
Learning from an Expert strengthens knowledge and memory, and generates confidence in future difficult decisions.

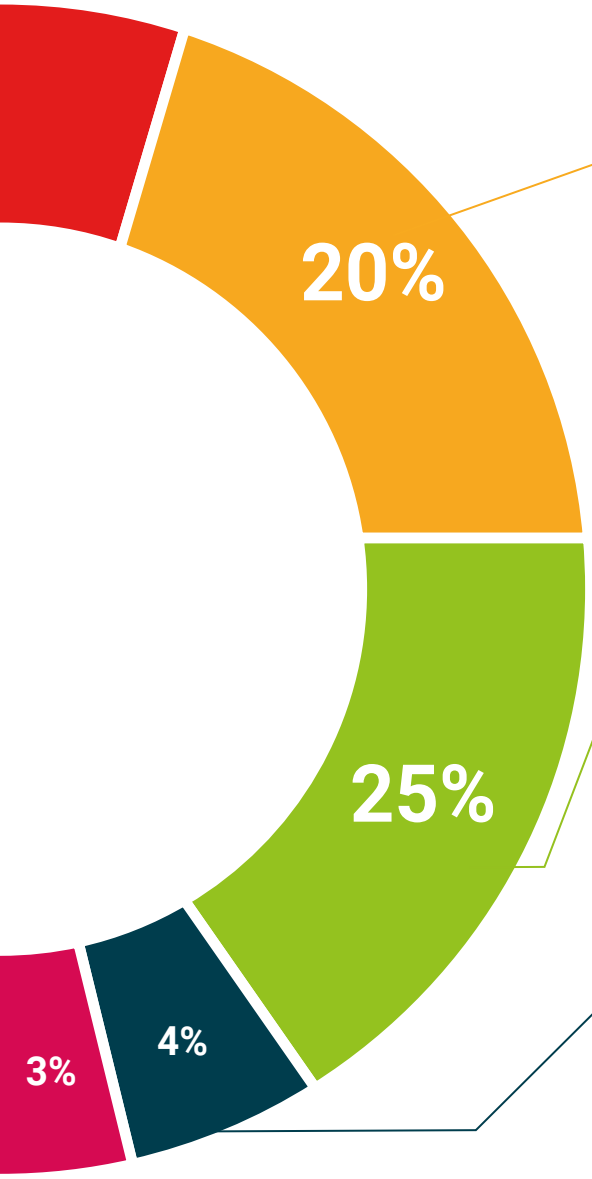
### Practising Skills and Abilities

They will carry out activities to develop specific skills and abilities in each subject area. Exercises and activities to acquire and develop the skills and abilities that a specialist needs to develop in the context of the globalization we live in.

### Additional Reading

Recent articles, consensus documents and international guidelines, among others. In TECH's virtual library, students will have access to everything they need to complete their course.






### Case Studies

Students will complete a selection of the best case studies chosen specifically for this program. Cases that are presented, analyzed, and supervised by the best specialists in the world.

### Interactive Summaries

The TECH team presents the contents attractively and dynamically in multimedia lessons that include audio, videos, images, diagrams, and concept maps in order to reinforce knowledge.

This exclusive educational system for presenting multimedia content was awarded by Microsoft as a "European Success Story".

### Testing & Retesting

We periodically evaluate and re-evaluate students' knowledge throughout the program, through assessment and self-assessment activities and exercises, so that they can see how they are achieving their goals.

06

# Certificate

The Master's Degree in Video Game Programming guarantees students, in addition to the most rigorous and up-to-date education, access to a Master's Degree issued by TECH Global University.

*Successfully complete this program and receive your university qualification without having to travel or fill out laborious paperwork"*

This program will allow you to obtain your **Master's Degree diploma in Video Game Programming** endorsed by **TECH Global University**, the world's largest online university.

**TECH Global University** is an official European University publicly recognized by the Government of Andorra (***official bulletin***). Andorra is part of the European Higher Education Area (EHEA) since 2003. The EHEA is an initiative promoted by the European Union that aims to organize the international training framework and harmonize the higher education systems of the member countries of this space. The project promotes common values, the implementation of collaborative tools and strengthening its quality assurance mechanisms to enhance collaboration and mobility among students, researchers and academics.

This **TECH Global University** title is a European program of continuing education and professional updating that guarantees the acquisition of competencies in its area of knowledge, providing a high curricular value to the student who completes the program.

Title: **Master's Degree in Video Game Programming**

Modality: **online**

Duration: **12 months**

Accreditation: **60 ECTS**


tech global university

Mr./Ms. _____, with identification document _____
has successfully passed and obtained the title of:

**Master's Degree in Video Game Programming**

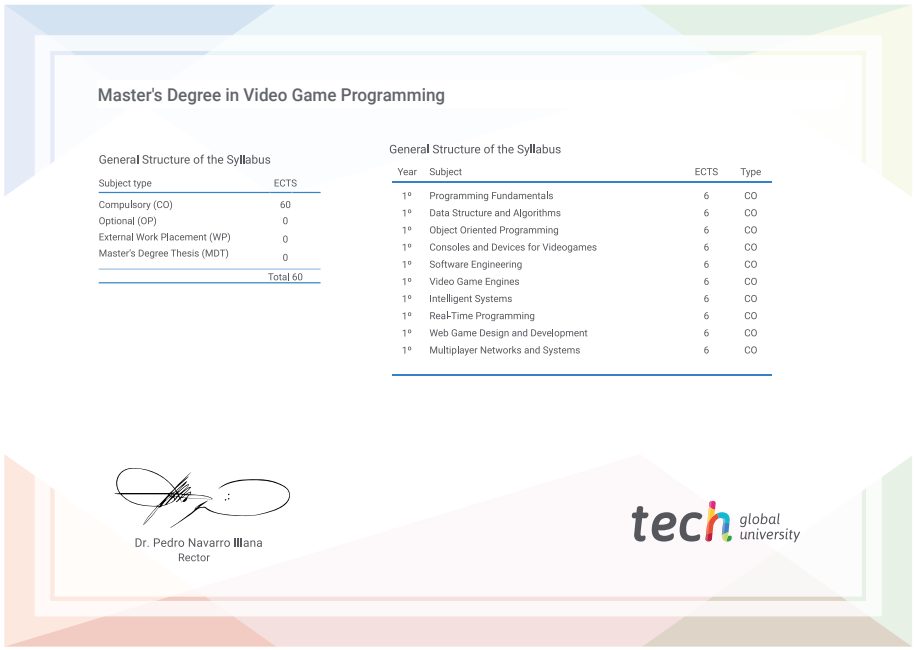
This is a program of 1,500 hours of duration equivalent to 60 ECTS, with a start date of dd/mm/yyyy and an end date of dd/mm/yyyy.

TECH Global University is a university officially recognized by the Government of Andorra on the 31st of January of 2024, which belongs to the European Higher Education Area (EHEA).

In Andorra la Vella, on the 28th of February of 2024

Dr. Pedro Navarro Illana
Rector

Unique TECH Code: AFWORD23S techtitute.com/certificates


**Master's Degree in Video Game Programming**

General Structure of the Syllabus

| Subject type | ECTS |
|---|---|
| Compulsory (CO) | 60 |
| Optional (OP) | 0 |
| External Work Placement (WP) | 0 |
| Master's Degree Thesis (MDT) | 0 |
| | Total 60 |

General Structure of the Syllabus

| Year | Subject | ECTS | Type |
|---|---|---|---|
| 1º | Programming Fundamentals | 6 | CO |
| 1º | Data Structure and Algorithms | 6 | CO |
| 1º | Object Oriented Programming | 6 | CO |
| 1º | Consoles and Devices for Videogames | 6 | CO |
| 1º | Software Engineering | 6 | CO |
| 1º | Video Game Engines | 6 | CO |
| 1º | Intelligent Systems | 6 | CO |
| 1º | Real-Time Programming | 6 | CO |
| 1º | Web Game Design and Development | 6 | CO |
| 1º | Multiplayer Networks and Systems | 6 | CO |

Dr. Pedro Navarro Illana
Rector

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*Apostille Convention. In the event that the student wishes to have their paper diploma issued with an apostille, TECH Global University will make the necessary arrangements to obtain it, at an additional cost.

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# Master's Degree

## Video Game Programming

- Modality: **online**
- Duration: **12 months**
- Certificate: **TECH Global University**
- Credits: **60 ECTS**
- Schedule: **at your own pace**
- Exams: **online**

# Master's Degree
## Video Game Programming

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