Course guide
804237 - DESVJ - Video Game Development

Last modified: 10/09/2026

Unit in charge: Image Processing and Multimedia Technology Centre
Teaching unit: 804 - CITM - Image Processing and Multimedia Technology Centre.

Degree: BACHELOR'S DEGREE IN VIDEO GAME DESIGN AND DEVELOPMENT (Syllabus 2014). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Spanish, English

LECTURER

Coordinating lecturer: Pedro Omedas

Others:

TEACHING METHODOLOGY

Throughout the course, students will collaborate in pairs to work on the development of a 2D platform game using C++ and the SDL library. In each class, the lecturer will demonstrate various approaches and share best practices for implementing functionalities in their projects. To support their learning, the lecturer will provide source code examples and templates for the students to study, complete, and integrate into their own source code for future reference and practical application.

At the end of each session, the lecturer will offer ideas for enhancing the game systems, presenting challenges that encourage students to explore and improve their projects independently. This guidance aims to assist and guide students during their self-learning time, enabling them to develop their skills further and foster a sense of autonomy.

By following this teaching approach, students not only gain hands-on experience in game development, but also receive direct guidance and exposure to industry-standard techniques and practices. The combination of collaborative work, practical examples, and independent learning opportunities ensures a well-rounded and engaging learning experience throughout the course.

LEARNING OBJECTIVES OF THE SUBJECT

- To identify graphic libraries for the creation of synthetic images, 2D and 3D graphics and user interfaces.

- To use programming languages, algorithmic patterns, data structures, visual programming tools, game engines, libraries and servers for the development of video games of different genres and for different platforms and devices.

- Apply the basic techniques of parallel, concurrent, distributed and real-time programming, in the development of video games for local or online games.

- To apply graphic, physical, artificial intelligence, augmented and virtual reality, user interfaces and human-computer interaction techniques to video game projects efficiently.

- To develop video games, through the use of programming languages, algorithmic patterns, data structures, visual programming tools, game engines, libraries and servers.

- To identify the architecture of a 2D game engine, including its main components and its functions in the development of the game.

- To develop the capabilities of the game engine incorporating new functions such as entities, GUIs, maps and physics systems, so that the game experiences are attractive.

STUDY LOAD

Type	Hours	Percentage
Self study	90,0	60.00
Guided activities	12,0	8.00
Hours medium group	30,0	20.00
Hours large group	18,0	12.00

Total learning time: 150 h

CONTENTS

Controlling the FPS and timing the logic

Description:
How to control the frame rate.
Ways of manipulating the timing of the logic (pause, bullet time, etc.)

Full-or-part-time: 13h
Theory classes: 5h
Self study : 8h

Controlling game entities

Description:
Theory behind the entity systems for video games.
Coding a full featured entity system.

Full-or-part-time: 19h
Theory classes: 9h
Self study : 10h

Loading and rendering Tiled maps

Description:
Usage of Tiled to create 2D maps.
Introduction to the TMX file format.
Code to load data from TMX files.
Methodology to render ortogonal maps.
Methodology to render isometric maps.

Full-or-part-time: 22h
Theory classes: 8h
Self study : 14h

Serialization

Description:
Theory behind the art of loading resources in video games.
Formats (XML, JSON, YAML).
Serialization of objects using libraries.
Load and save data.

Full-or-part-time: 16h
Theory classes: 6h
Self study : 10h

Meta information and mask maps

Description:
Using Tiled for storing meta information.
Loading of meta information for navigation.
Alternative case of using mask maps for navigation.

Full-or-part-time: 13h
Theory classes: 5h
Self study : 8h

Pathfinding algorithms

Description:
BFS (Breadth First Search).
Dijkstra.
A*

Full-or-part-time: 30h
Theory classes: 12h
Self study : 18h

Física

Description:
Integrating the Box2D physics engine.
Learn how to use functions from the physics library.

Full-or-part-time: 8h
Theory classes: 4h
Self study : 4h

Graphical User Interface systems

Description:
Windows with scroll.
Buttons with images.
Textboxes.
Progress bars.

Full-or-part-time: 25h
Theory classes: 10h
Self study : 15h

Optimization

Description:
Profiling, memory leaks detection.

Full-or-part-time: 4h
Theory classes: 2h
Self study : 2h

ACTIVITIES

Assigment 1

Description:
Create a simple platformer game with the following elements:
-Config file loading
-Data serialization
-Tiled TMX map loading and drawing (orthographic)
-Map collisions detection (platforms)
-Map navigation: player movement and jumping
-Game should be capped to stable 60 frames per second without vsync.

Full-or-part-time: 10h
Self study: 10h

Assigment 2

Description:
Expanding the platformer from the previous assignment we need to add:
-Walking enemy type that can pathfind to the player. It is not needed that the enemy can jump (although is encouraged) but it should detect that it can reach the player by normal walking and falling down to other platforms.
-Flying enemy type that can pathfind to the player avoiding non-walkable areas.
-Load/Save must consider each enemy state. Enemies normally have a range of perception and not react to the player until they are close by.

Full-or-part-time: 10h
Self study: 10h

Assigment 3

Description:
Expanding the platformer from the previous assignment we need to add:
-Entity System
-GUI: Title Screen Main Menu
-GUI: Gameplay Screen HUD
-GUI: Gameplay Screen Pause Menu
-Game profiling

Full-or-part-time: 10h
Self study: 10h

GRADING SYSTEM

Any academic fraud, plagiarism or use or possession of unauthorised means in an assessment activity leads to a mark of zero (0) for the affected test or assignment. Furthermore, in accordance with the University's regulations, if disciplinary proceedings are initiated the subject is recorded as "Pending Assessment" until a decision is reached. These incidents are managed in accordance with the **Action Framework for Academic Integrity in Assessment at the UPC**.

Three assignments with a weight of 20%, 20% and 20% each of the final grade.
One final examination with a total weight of 30% of the final grade. It will consist of a two-hour practical and theoretical test.
One revaluation with a total weight of 30% of the final grade (final exam). It will consist of a two-hour practical and theoretical test.
In case of passing the course, the maximum final mark will be 5.
A final 10% grade will be about class participation and attitude.

Irregular actions that may lead to a significant variation of the grade of one or more students constitute a fraudulent performance of an evaluation act. This action entails the descriptive grade of failure and a numerical grade of 0 for the ordinary global evaluation of the course, without the right to re-evaluation.

If the lecturers have indications of the use of AI tools not allowed in the evaluation tests, they may summon the students concerned to an oral test or a meeting to verify the authorship.

BIBLIOGRAPHY

Complementary:
- Thorn, A. Game engine design and implementation. Sudbury, Mass: Jones & Bartlett Learning, 2011. ISBN 9780763784515.
- McShaffry, M.; Graham, D. Game coding complete. 4th ed. Boston, Mass: Course Technology, 2012. ISBN 9781133776574.
- Gregory, J. Game engine architecture. 2nd ed. Boca Raton: CRC Press, 2014. ISBN 9781466560017.