



## Course guides

### 804246 - MVJ - Game Engines

Last modified: 07/04/2021

**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:** 2021    **ECTS Credits:** 6.0    **Languages:** Catalan, Spanish, English

#### LECTURER

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**Coordinating lecturer:** Garrigó Invers, Marc

**Others:**

#### PRIOR SKILLS

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Coding in C++. Previous knowledge and experience coding 2D games.

#### TEACHING METHODOLOGY

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During each class, the lecturer will first show the students the theory behind the problem that needs solving. Together with the students, the lecturer will explore the different solutions that exist in the present that solve and simplify the complexities of real time applications like videogames.

#### LEARNING OBJECTIVES OF THE SUBJECT

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- Understand how to organize the rendering pipeline and proper loading of a 3D scene.
- Knowledge in how to integrate 3D animation systems.
- Internal structure for entities and their components.
- Audio for 3D environments.
- Most common graphic techniques.

#### STUDY LOAD

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

**Total learning time:** 150 h



## CONTENTS

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### OpenGL basics

**Description:**

Initialization  
Rendering in direct mode  
Vertex Buffers

**Full-or-part-time:** 15h

Theory classes: 6h  
Self study : 9h

### Loading 3D models

**Description:**

Loading of model information: geometry and materials  
Rendering of single models

**Full-or-part-time:** 10h

Theory classes: 4h  
Self study : 6h

### Camera and scene loading

**Description:**

Free roaming camera, FPS style and single model  
Loading scene information  
Execution in threads

**Full-or-part-time:** 15h

Theory classes: 6h  
Self study : 9h

### Basic rendering optimizations

**Description:**

Frustum culling  
Level of details  
Octree

**Full-or-part-time:** 10h

Theory classes: 4h  
Self study : 6h



### Animation systems

**Description:**

Implementing a Transformation Tree  
Structure of an animation system  
Loading of animations  
Playing and blending of animations

**Full-or-part-time:** 25h

Theory classes: 10h  
Self study : 15h

### Component structure and player control

**Description:**

Component system for entities  
Messaging and event system  
Physics and player control

**Full-or-part-time:** 30h

Theory classes: 12h  
Self study : 18h

### 3D Audio

**Description:**

Loading and playing music  
Playing 3D effects

**Full-or-part-time:** 10h

Theory classes: 4h  
Self study : 6h

### Graphics effects

**Description:**

Particle systems  
Postprocess effects  
Illumination models

**Full-or-part-time:** 20h

Theory classes: 8h  
Self study : 12h

## GRADING SYSTEM

Final exam with a weight of 30% with all subject knowledge will be put to test.

First assignment about scene loading (GameObjects and components) with a weight of 20%.

Second assignment about space optimizations, time management, mouse picking and optimized formats with a weight of 20%.

Third assignment about a single high level system to choose from: animation, particles, audio, scripting, physics, shaders or UI with a weight of 20%.

The final exam can be reevaluated for its weight of 30%

Attitude and class participation will weight 10%



## BIBLIOGRAPHY

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### Basic:

- Gregory, Jason. Game engine architecture. 2nd ed. Boca Raton: CRC Press, Taylor and Francis Group, cop. 2014. ISBN 9781466560017.
- Nystrom, Robert. Game programming patterns. [United States?]: Genever Benning, 2014. ISBN 9780990582908.