Course guides
804246 - MVJ - Game Engines

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
Coordinating lecturer: Antonio Uceda
Others: Rubén Ajenjo

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

TEACHING METHODOLOGY
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
- 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

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group</td>
<td>18,0</td>
<td>12.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90,0</td>
<td>60.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>12,0</td>
<td>8.00</td>
</tr>
<tr>
<td>Hours medium group</td>
<td>30,0</td>
<td>20.00</td>
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</tbody>
</table>

Total learning time: 150 h
CONTENTS

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:** 35h  
Theory classes: 17h  
Self study: 18h

### 3D Audio

**Description:**
Loading and playing music  
Playing 3D effects  

**Full-or-part-time:** 15h  
Theory classes: 9h  
Self study: 6h

### Graphics effects

**Description:**
Particle systems  
Postprocess effects  
Illumination models  

**Full-or-part-time:** 25h  
Theory classes: 13h  
Self study: 12h
ACTIVITIES

First assignment

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

Full-or-part-time: 12h
Theory classes: 6h
Self study: 6h

Second assignment

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

Full-or-part-time: 12h
Theory classes: 6h
Self study: 6h

Third assignment

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

Full-or-part-time: 12h
Theory classes: 6h
Self study: 6h

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%. In case of passing the course, the maximum final mark will be a 5.
Attitude and class participation will weight 10%

BIBLIOGRAPHY

Basic: