Course guide
804472 - PEV - Programming Visual Environments

Last modified: 18/05/2026

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

Degree: BACHELOR'S DEGREE IN DIGITAL DESIGN AND MULTIMEDIA TECHNOLOGIES (Syllabus 2023). (Compulsory subject).

Academic year: 2026 **ECTS Credits:** 6.0 **Languages:** Catalan

LECTURER

Coordinating lecturer: Löpfe, Lasse

Others:

TEACHING METHODOLOGY

The subject is divided in sessions of 2h, where three different activities take place:
1. Explanation of the main topics of the subject: the lecturer explains the new topics and presents the material to do the proposed activities (notes, exercises to solve, working plan, etc.).
2. Correction of exercises/activities: the student shares with the rest of the class the difficulties found during the resolution of the proposed activities and proposes solutions/alternatives related to the topics and technologies used. Some tests related to the work carried out during the course may be made.
3. Team work: the students develop the projects/activities proposed at class with the assistance of the lecturer.

LEARNING OBJECTIVES OF THE SUBJECT

Identify the complexity of the economic and social phenomena typical of the welfare society, relate welfare to globalisation and sustainability and make balanced and compatible use of technology, technology, economics and sustainability.

Knowledge
Recognise basic concepts related to electronics and microcontrollers and identify their potential application in the development of multimedia installations and products.
Identify the importance and design of multisensory feedback (visual, auditory, haptic) in multimedia applications.

Skills
Edit, transform and encode sound and digital image files through programming languages and authoring programs.
Use advanced programming techniques, integrating graphic, audiovisual, animation and sound resources to generate interactive applications.

- Understand the main topics to design and develop virtual environments.
- Accquire the basic knowledge of the software used to develop virtual environments: Unity3D in our case.
- Apply the accquired knowledge in decisiton making, work planning and bibliography research to be able to develop virtual environments in a satisfactory way.
- Be able to communicate in a proper way the results of your work.
- Be able to plan and use the information required to present an academic project (the TFG, for instance) by means of a critical reflection on the resources used.

STUDY LOAD

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

Total learning time: 150 h

CONTENTS

1. Introduction

Description:
0. What virtual environments are and their applications

1. Virtual environment software: Unity3D
☐1.1. Interface
☐1.2. Game objects
☐1.3. Components
☐☐1.3.1. Transform
☐☐1.3.2. Renderer
☐1.4. Object children (child objects)
☐1.5. Basics of C#
☐1.6. Inputs

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

2. Animations

Description:
2.1 Animation clips
2.2 Animator
2.3 Blend Trees
2.4 Animation Layers
2.5 Inverse Kinematics

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

3. Physics

Description:
3.1 Physics system, Rigidbody
3.2 Collider types
3.3 Collision handling
3.4 Applying forces

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

4. Coding modules

Description:
4.1 Spawn & Shoot
4.2 Raycasts
4.3 Coroutines
4.4 Observer Pattern
4.5 Interfaces
4.6 SOLID Principles

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

5. Player

Description:
5.1 Character Controller
5.2 Gravity
5.3 Jumps
5.4 Character Controller & Physics
5.5 Animating the Character
5.6 Camera

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

6. VFX

Description:
6.1 Particle System
6.2 VFX Graph
6.3 Shader Graph

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

7. Audio

Description:
7.1 Audio Source properties
7.2 Audio Mixer
7.3 Audio Manager
7.4 External Audio Tools (FMOD)

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

8. Lighting & Postprocessing

Description:
8.1 Types of lights
8.2 Baking
8.3 Light Probes
8.4 Reflection Probes
8.5 Postprocessing

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

9. Menu and Game Flow

Description:
9.1 Scene Management
9.2 UI System
9.3 Pause Menu

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

10. NPCs

Description:
10.1 Patrolling
10.2 Player detection
10.3 Health system
10.4 Dialogue system

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

GRADING SYSTEM

Practical Work. Submission of a group project:
Continuous assessment: 15%
Final submission: 25%

Exams
5 midterm exams with a total weight of 40% of the final course grade. Each exam is worth 8% of the final grade.

Self-assessment
Self-assessment report on the practice exams and contribution to the group project: 10%

Participation and Learning Attitude
The evaluation of the student's participation in the course activities and learning attitude will be based on their involvement in class and the percentage of completed exercises and practical assignments. This counts for 10% of the final grade.

Students who do not pass the course through continuous assessment will have the option to take a re-assessment (only the 40% corresponding to the midterm exams will be re-assessed).
The final grade after re-assessment can be at most a 5 (out of 10).

Irregular actions that may lead to a significant variation in the grade of one or more students constitute a fraudulent performance of an evaluation act. This action will lead to a descriptive grade of fail and a numerical grade of 0 for the ordinary global assessment of the subject, without the right to re-evaluation.
If the teachers have evidence of the use of AI tools that are not permitted in the assessment tests, they may summon the students involved to an oral test or a meeting to verify the authorship.

EXAMINATION RULES.

Part of the activities will be developed at class with the assistance of the lecturer. Students should also work autonomously to finish the activities proposed during the course.

Projects will be submitted via Campus Virtual following the guidelines provided by the instructions document of each one (name of the files, etc.). Projects submitted after midnight of the specified date will be considered as NP. Any issues that do not allow the student to submitt a project in time should have a reasonable cause and must be communicated with enough anticipation to the lecturer. The evaluation of the projects does not consist just on submitting the code, but also on oral presentations when required.

Projects have to be executed at CITM, so be sure that you work with the same Unity3D version as the one provided at the center and that your projects can be executed there without errors.

BIBLIOGRAPHY

Basic:
- Harrison Ferrone. Learning C# by Developing Games with Unity 2020: An enjoyable and intuitive approach to getting started with C# programming and Unity. 5th. Birmingham: Packt Publishing, 2020. ISBN 978-1-80020-780-6.
- Doran, John P. / Zucconi, Alan. Unity 2018 Shaders and Effects Cookbook: Transform your game into a visually stunning masterpiece with over 70 recipes. 3rd. Birmingham: Packt, 2018. ISBN 978-11-78839-623-3.
- Ciarán Robinson. Game Audio with FMOD and Unity. 1st. New York: Taylor & Francis, 2019. ISBN 978-1-138-31597-6.

RESOURCES

Other resources:
Unity3D: https://unity3d.com />API Scripting Unity3D: https://docs.unity3d.com/ScriptReference/ />Unity3D tutorials: https://unity3d.com/es/learn/tutorials />https://www.raywenderlich.com/unity (Godot)
https://www.youtube.com/@CodeMonkeyUnity />https://www.youtube.com/@Brackeys />https://www.youtube.com/@Unity3dCollege