Course Unit	Graphics Computing			Field of study	Computer Science	
Bachelor in	Game Design			School	School of Public Management, Communication and Tourism	
Academic Year	2023/2024	Year of study	2	Level	1-2	ECTS credits	6.0
Type	Semestral	Semester	1	Code	8309-801-2103-00-23	

Workload (hours)	162	Contact hours	T	-	TP	15	PL	45	TC	-	S	-	E	-	OT	-	O	-

T - Lectures; TP - Lectures and problem-solving; PL - Problem-solving, project or laboratory; TC - Fieldwork; S - Seminar; E - Placement; OT - Tutorial; O - Other

Name(s) of lecturer(s)	João Pedro Carneiro Borges Gomes

Learning outcomes and competences

At the end of the course unit the learner is expected to be able to:
1. Master the Fundamentals of 2D and 3D Computer Graphics.
2. Develop Interactive Real-Time Rendering Applications.
3. Set up a 3D Rendering Environment.
4. Use the Unity tool to develop graphics applications.
5. Recognize the importance of Computer Graphics in Digital Game Development.

Prerequisites

Before the course unit the learner is expected to be able to:
1. Create algorithms and implement them according to the Object-Oriented Programming paradigm.
2. Understand the fundamental concepts of Calculus, Linear Algebra and Analytic Geometry.

Course contents

Concepts of Computer Graphics. Development of Real-Time Interactive Applications. Placement of Computer Graphics in the Development of Digital Games.

Course contents (extended version)

1. Introduction to Computer Graphics
2. Introduction to Unity
   - Basic 3D Programming Principles
   - Summary of the CG Pipeline
3. Geometric Primitives and Buffers
   - Unity Primitives
   - Solid Objects
4. Geometric Tranformations - The Unity pipeline
   - Using Projections
   - Cameras and Actors
5. Colors, Materials and Lighting
   - Colors and Materials
   - Lighting and Effects
   - Blending and Fog
6. Unity Imaging
7. Texture Mapping
8. Curves and Surfaces
9. Importing external Assets
10. Advanced Concepts

Recommended reading

1. Marschner, S., Shirley, P. (2022). Fundamentals of computer graphics. CRC Press. ISBN: 978-0-367-50503-5 (hbk), 978-0-367-50558-5 (pbk), 978-1-003-05033-9 (ebk).
2. Han, J. (2011). 3D Graphics for Game Programming. CRC Press. ISBN: 978-1439827376.
3. Paquette, A. (2013). An Introduction to Computer Graphics for Artists (2nd ed.). Springer. ISBN:978-1-4471-5099-2.
4. Hardman, C. (2020). Game Programming with Unity and C#: A Complete Beginner's Guide. Apress. ISBN: 9781484256565
5. Pereira, J., Brisson, J., Coelho, A., Ferreira, A., & Gomes, M. (2018). Introdução à Computação Gráfica. FCA. ISBN: 978-972-722-877-5.

Teaching and learning methods

Introduction of fundamental concepts and principles using lectures with visual presentations and practical examples to facilitate student understanding. Application of concepts in practical classes. Use of online resources and tutorials. Encouraging autonomous work and the realization of personal projects. Interdisciplinary projects, promoting teamwork.

Assessment methods

- Final evaluation - (Regular, Student Worker) (Final, Supplementary, Special)
   - Practical Work - 55% (Individual assignments, submitted throughout the semester)
   - Presentations - 10%
   - Projects - 10% (Interdisciplinary Week Project)
   - Projects - 25% (Capstone Project)

Language of instruction

Portuguese, with additional English support for foreign students.

Electronic validation

João Pedro Carneiro Borges Gomes	Barbara Costa Vilas Boas Barroso	Anabela Neves Alves de Pinho	Luisa Margarida Barata Lopes
11-10-2023	12-10-2023	13-10-2023	09-11-2023

Electronic validation

João Pedro Carneiro Borges Gomes	Barbara Costa Vilas Boas Barroso	Anabela Neves Alves de Pinho	Luisa Margarida Barata Lopes
11-10-2023	12-10-2023	13-10-2023	09-11-2023