Course guide
270537 - JC - Computer Games

Last modified: 02/02/2024

Unit in charge:	Barcelona School of Informatics
Teaching unit:	723 - CS - Department of Computer Science.

Degree:	MASTER'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2012). (Optional subject).

Academic year: 2023 **ECTS Credits:** 3.0 **Languages:** Catalan, Spanish

LECTURER

Coordinating lecturer:	ANTONIO CHICA CALAF
Others:	Segon quadrimestre: ANTONIO CHICA CALAF - 10

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.

Basic:
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

TEACHING METHODOLOGY

The course spans six weeks with four hours a week of classroom lectures and labs.

In weekly sessions of two hours, the teacher will present the concepts and techniques studied.

From a practical point of view, students will develop a project in groups appropriate to the load required for the course.

Each week there will be a two-hour lab class in which students will receive guidance.

LEARNING OBJECTIVES OF THE SUBJECT

1.To be exposed to general architectures for multimedia applications as well as to develop the hability of developing these kind of applications.
2.To learn the basis on which advanced 3D graphic applications are built by developing specific prototypes.
3.To learn how to implement applications that simulates physical phenomena studied in the course and their applications to computer games and virtual reality environments.
4.To be able to effectively communicate in writting which is the solved problem as well as which is the technical solution developed

STUDY LOAD

Type	Hours	Percentage
Hours small group	13,5	18.00
Self study	48,0	64.00
Hours large group	13,5	18.00

Total learning time: 75 h

CONTENTS

Introduction

Description:
Introduction to game development. Basics. Development tools.

Game programming

Description:
Basics concepts. Game Loop. Scripting.

Graphics

Description:
Asset management. Model import. Tilemaps and sprites. Animation.

AI

Description:
Inteligència artificial: patrons, màquines d'estats.

Physics

Description:
Rigid Bodies. Collision detection and triggers. Physics materials.

Videogame design

Description:
Understand the concepts behind video game design, in particular the importance of gameplay and its relation to application usability.

Effects

Description:
Appearance improving effects. Shaders. Particle systems.

ACTIVITIES

Videogame architecture

Description:
Description of the basic architecture of a game. Game Loop - Presentation and update. Definition of game engine and its components.

Specific objectives:
1

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.

Full-or-part-time: 7h
Laboratory classes: 2h
Self study: 5h

Levels

Description:
Tilemap based engines, use of multiple layers, dense and scattered layers, scroll, parallax effect and types of cameras.

Specific objectives:
3

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

Entities

Description:
Graphic representation of entities in a video game: sprites, animation and effects.

Specific objectives:
2, 3

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

AI for video games

Description:
Pathfinding, finite state machines and rule systems. Action-oriented intelligence and tactical intelligence.

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

Physics

Description:
Kinematics and dynamics of the rigid solid. Collisions.

Specific objectives:
3

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE11. Capability to conceptualize, design, develop and evaluate human-computer interaction of products, systems, applications and informatic services.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

Full-or-part-time: 12h
Laboratory classes: 4h
Self study: 8h

Effects

Description:
Using shaders. Particle systems.

Specific objectives:
1, 2

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE10. Capability to use and develop methodologies, methods, techniques, special-purpose programs, rules and standards for computer graphics.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CB9. Possession of the learning skills that enable the students to continue studying in a way that will be mainly self-directed or autonomous.

Full-or-part-time: 6h
Laboratory classes: 2h
Self study: 4h

Videogame design

Description:
Video game design concepts. Gameplay. Storyboard of the game. Design document.

Specific objectives:
1, 4

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.
CB8. Capability to communicate their conclusions, and the knowledge and rationale underpinning these, to both skilled and unskilled public in a clear and unambiguous way.

Full-or-part-time: 6h
Laboratory classes: 2h
Self study: 4h

Additional systems

Description:
Scripting systems. Audio management.

Specific objectives:
1

Related competencies :
CTE1. Capability to model, design, define the architecture, implement, manage, operate, administrate and maintain applications, networks, systems, services and computer contents.
CTE12. Capability to create and exploit virtual environments, and to the create, manageme and distribute of multimedia content.
CB6. Ability to apply the acquired knowledge and capacity for solving problems in new or unknown environments within broader (or multidisciplinary) contexts related to their area of study.

Full-or-part-time: 6h
Laboratory classes: 2h
Self study: 4h

GRADING SYSTEM

Students will create a video game that applies the contents of this course.

This project will be evaluated in two parts. One will evaluate the merits of the practical project developed by the students. This part will have a partial delivery (NP) and a final one (NF). The second part will evaluate a technical report on the project (NM) that each student will write, following the guidelines that the teacher will publish.

The three grades (NP, NF, NM) will be combined to determine the course's grade:

N = 0.3 NP + 0.4 NF + 0.3 NM

BIBLIOGRAPHY

Basic:
- Watt, A.H.; Policarpo, F. 3D games. Addison-Wesley, 2001-2003. ISBN 0201619210.