Course guide
340763 - DAVI - Development of Graphic Applications and Videogames for Mobiles Devices

Last modified: 29/04/2025

Unit in charge:	Vilanova i la Geltrú School of Engineering
Teaching unit:	723 - CS - Department of Computer Science.

Degree: BACHELOR'S DEGREE IN INFORMATICS ENGINEERING (Syllabus 2018). (Optional subject).

Academic year: 2025   **ECTS Credits:** 6.0   **Languages:** Catalan

LECTURER

Coordinating lecturer: Alejandro Ríos

Others:

PRIOR SKILLS

Knowledge of C++ language.
Knowledge of Object Oriented Programming.
Knowledge of class diagrams.
It is essential to have a laptop with a minimum of 8Gb of RAM and last generation graphics card
Recommended: have an Android device

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

I_CECO1. CEC01. Ability to have a thorough understanding of the fundamental principles and models of computation, ability to apply the principles to interpret, select, evaluate, model, and create new concepts, theories, applications and advance the technological development related to computing.

I_CECO3. CEC03. Ability to assess the computational complexity of a problem, to know algorithmic strategies that may lead to its resolution and to recommend, develop and implement the one which guarantees the best performance according to established requirements.

I_CECO6. CECO6. Ability to develop and assess interactive and presentation of complex information systems and their application in solving problems of designing human being-computer interaction.

I_CEFB4. CEFB4. Basic knowledge of use and computer programming, as well as of operating systems, data base and generally informatic programs with engineering applications.

I_CEFC1. CEFC1. Ability to design, develop, select and value applications and informatic systems affirming its reliability, security and quality corresponding to ethical principals and legislation and current rules.

I_CEFC15. CEFC15. Knowledge and application of basic principles and techniques of intelligent systems and their practical application.

I_CEFC16. CEFC16. Knowledge and application of principals, methodologies, life cycles of programming engineering.

I_CEFC17. CEFC17. Ability to design and evaluate computer interfaces that guarantee accessibility and usability of informatic systems, services and applications.

I_CEFC5. CEFC5. Knowledge, management and maintenance of systems, computing services and applications.

I_CEFC6. CEFC6. Basic knowledge and application of algorithmic processes, informatic techniques to design solutions of problems, analyzing if proposed algorisms are apt and complex.

I_CEFC7. CEFC7. Knowledge, design and efficient use of data types and structures the most appropriate to resolve problems.

I_CEFC8. CEFC8. Ability to analyze, to design, to construct and to maintain applications in a well built, secure and efficient way choosing the most adequated paradigms and languages.

I_CEIS4. CEIS4. Ability to identify and analyze problems and design, develop, deploy, test and document software solutions based on an adequate knowledge of theories, models and techniques.

I_CETI1. CETI1. Ability to understand the environment of an organization and its needs in the field of information technology and communications.

I_CETI3. CETI3. Ability to set up methodologies focused on user and development organization, valuation and application management and systems based on information technologies which secure ergonomic accessibility and use of

Transversal:

04 COE N1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

04 COE N2. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.

04 COE N3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 3. Communicating clearly and efficiently in oral and written presentations. Adapting to audiences and communication aims by using suitable strategies and means.

04 COE. EFFICIENT ORAL AND WRITTEN COMMUNICATION. Communicating verbally and in writing about learning outcomes, thought-building and decision-making. Taking part in debates about issues related to the own field of specialization.

05 TEQ N3. TEAMWORK - Level 3. Managing and making work groups effective. Resolving possible conflicts, valuing working with others, assessing the effectiveness of a team and presenting the final results.

05 TEQ N2. TEAMWORK - Level 2. Contributing to the consolidation of a team by planning targets and working efficiently to favor communication, task assignment and cohesion.

05 TEQ N1. TEAMWORK - Level 1. Working in a team and making positive contributions once the aims and group and individual responsibilities have been defined. Reaching joint decisions on the strategy to be followed.

05 TEQ. TEAMWORK. Being able to work as a team player, either as a member or as a leader. Contributing to projects pragmatically and responsibly, by reaching commitments in accordance to the resources that are available.

07 AAT N1. SELF-DIRECTED LEARNING - Level 1. Completing set tasks within established deadlines. Working with recommended information sources according to the guidelines set by lecturers.

07 AAT N2. SELF-DIRECTED LEARNING - Level 2: Completing set tasks based on the guidelines set by lecturers. Devoting the time needed to complete each task, including personal contributions and expanding on the recommended information sources.

07 AAT N3. SELF-DIRECTED LEARNING - Level 3. Applying the knowledge gained in completing a task according to its relevance and importance. Deciding how to carry out a task, the amount of time to be devoted to it and the most suitable information sources.

07 AAT. SELF-DIRECTED LEARNING. Detecting gaps in one's knowledge and overcoming them through critical self-appraisal. Choosing the best path for broadening one's knowledge.

CT5. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

TEACHING METHODOLOGY

The classes will be mainly in Catalan.
This is a practical course, using a personal computer. The student is responsible for his own learning.
The course is divided into two periods. The first comprises 40% of the course and the second 60%.
During the first period of the course, the teacher introduces training pills on different aspects of video game development. Next, small projects that must be submitted will be presented.
During the second period of the course, a team project is developed using the PBL or CBL methodology. In each class, the teacher evaluates the work of the students and supports them to advance their project.

LEARNING OBJECTIVES OF THE SUBJECT

At the end of the course, the student will be able to:

* Describe the historical evolution of video games, identifying key stages and major trends.
* Analyze the current video game market, recognizing its main stakeholders, business models, and consumer dynamics.
* Explain the typical organizational structure of a video game development company, as well as the functions of the various professional roles involved.
* Identify and compare the most widely used contemporary game engines, evaluating their features, advantages, and limitations.
* Use a game engine to implement basic mechanics, integrate audiovisual assets, and optimize game performance on mobile devices.
* Describe the necessary elements for developing a 2D game.
* Describe the necessary elements for developing a 3D game.
* Apply advanced programming techniques to develop scalable and efficient video games.
* Implement virtual or augmented reality applications for mobile devices.

STUDY LOAD

Type	Hours	Percentage
Hours small group	30,0	20.00
Hours large group	30,0	20.00
Self study	90,0	60.00

Total learning time: 150 h

CONTENTS

Introduction to video game development

Description:
* History of the development of video games
* The video game industry
* Structure of a video game company
* Professional outings: gamedevmap
* Jobs related to video games: art, design, programming, production, sound, ai, physical, fx (technical artist)
* Tools, libraries, game engines
* Video games as non-ludic tools

Specific objectives:
At the end of the module the student will be able to
* Identify the main stages of the evolution of video games.
* Describe the video game industry and the structure of a video game company
* Analyse the professional market of video games
* Describe the different tasks that can be performed in a video game company
* Describe the game engines and their characteristics
* Analyze the different uses that can be given to video games apart from the playful component

Full-or-part-time: 2h
Theory classes: 2h

2D Videogames

Description:
Basic concepts, genres of 2D video games, classifications, elements that allow to build 2D video games, common mechanics, introduction to a 2D game engine

Specific objectives:
At the end of the module the student will be able to
* Describe the basic concepts related to the development of 2D video games: sprite, spritesheet, animation, tile, tilemap
* Describe the most common genres of 2D video games
* Recognize the type of projection used in a 2D video game
* Identify the difficulties involved in the development of a 2D video game according to its type
* Name the usual mechanics of a 2D video game
* Describe the basic characteristics of the best known 2D game engines

Full-or-part-time: 4h
Theory classes: 4h

2D video game programming

Description:
2D video game programming by introducing methodology to develop code efficiently and scalable.

Specific objectives:
At the end of the module the student will be able to
* Describe the concepts related to the programming of a game: frame, framerate, lag
* Recognize the main loop of a game
* Apply the principle of unique responsibility as the first good programming practice
* Apply the Open/Closed principle as a second good programming practice
* Development of a simple game with Unity: Asteroids
- Introduction of sprites and spritesheets
- Introduction of movement
- Interficies
- Input system
- Introduction of sound
- Introduction of animations
- Introduction of enemies
- Events
- Introduction of collisions
- Introduction of inheritance and polymorphism
- Reuse of code
* Introduction to game programming paterns: Observer and MVC patterns

Related activities:
Exercise 1: Implementation of a 2D game

Full-or-part-time: 16h
Guided activities: 8h
Self study : 8h

3D Video games

Description:
* Elements of a 3D game: coordinate systems, triangle meshes (faces, vertexes, edges), terrains, skymap, textures, characters, skeleton, animations, particles, occlusion culling, LOD
* 3D visualization: camera types, lighting, light types, shadows, ray tracing, shaders, ambient oclusion
* Smart NPC's, pathfinding
* More design patterns
* Use of Unity to develop 3d games

Specific objectives:
At the end of the module the student will be able to:
* Describe and use the basic elements to develop a 3D game
* Create scenarios with realistic 3D lighting
* Use 3D characters to give the game dynamism
* Develop 3D game mechanics
* Apply design patterns and good SOLID programming practices to develop efficient and scalable games

Related activities:
Exercise 3: Implementation of a complete 3D game

Full-or-part-time: 14h
Theory classes: 6h
Guided activities: 8h

Game design

Description:
Introduction to game design

Specific objectives:
At the end of the module the student will be able to
* Describre the concepts relacted to game design
* Develop a simple Game Design Document
* Describe the Timeline of a game: alpha, beta, gold, post mortem

Full-or-part-time: 2h
Theory classes: 2h

Virtual Reality, Augmented Reality and Mixed Reality

Description:
* Introduction to the basic concepts related to XR
* Problems to solve in games and XR applications
* XR with Unity

Related activities:
Exercise 3: XR project where case studies linked to the syllabus will be addressed

Full-or-part-time: 22h
Theory classes: 2h
Self study : 20h

GRADING SYSTEM

In total, 3 projects must be submitted and approved
* 2D project: 15%
* 3D project: 25%
* Final project: 60%