Bachelor in Design and Development of Video Games

Titles, contents and timetable

Escuela Técnica Superior de Ingeniería Informática

Universidad Rey Juan Carlos
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Prologue

This document contains information about titles, contents and timetable of subjects taught in the Bachelor in Design and Development of Video Games, offered at Rey Juan Carlos University, Escuela Técnica Superior de Ingeniería Informática. This information pretends to be helpful to international students interested in visiting our University.

Contents in this document referred to subjects taught during course 2021-2022. More information can be consulted in

https://www.urjc.es/estudios/grado/632-diseno-y-desarrollo-de-videojuegos
First Course
1.1 First Semester

1.1.1 Physics for Video games

The goal of this course is to provide students with the foundations of the two most important branches of physics for video games: electronics and mechanics. On electronics, the course includes the introduction to the representation of digital information, as well as the study of combinational and sequential circuits. On mechanics, the course includes understanding of kinematics, statics, dynamics, and their application to particles, rigid bodies and deformable bodies.

6 ECTS credits.

1.1.2 Discrete Mathematics


6 ECTS credits.

1.1.3 Visual Programming

Introduction to programming with Java. Control structures. Subprograms. Recursion. Data structure. Homogeneous data structure. Heterogeneous data structures and files

6 ECTS credits.

1.1.4 Narration, script and storyboard

The subject’s objective is the analysis of the narrative elements of the video game, its relationship with fictional universes and other media such as film, as well as the techniques of creating a video game project from the idea to the storyboard, going
through the creation of the story, the characters, actions, rules, etc.

6 ECTS credits.

1.1.5 2D design

The course deals with the following contents: Introduction to visual culture analysis. Concepts of drawing, color and composition. Basic skills of digital two-dimensional design with software tools (Photoshop). Basic concepts of 2D animation and examples with Adobe Animate. Basic 2D game programming techniques with Action Script with Adobe Animate and Unity.

6 ECTS credits.

1.2 Second Semester

1.2.1 Data Structures

Introduction: Complexity of algorithms; Concepts of Java programming language. Linear data structures: Linear Lists; Stacks; Queues. Non-linear data structures: Sets; Binary trees; Graphs; Maps and hash tables.

6 ECTS credits.

1.2.2 Geometric models

Introduction to trigonometry, Vector space, Affine geometry, Projections and virtual camera models. Curves and surfaces, Differential Geometry.

6 ECTS credits.
1.2.3 Basic legal principles: professional ethics and equality


6 ECTS credits.

1.2.4 Multimedia


3 ECTS credits.

1.2.5 3D design


6 ECTS credits.
1.2.6 Game design and playability fundamentals


3 ECTS credits.
Second Course
2.1 First Semester

2.1.1 Artistic Drawing


3 ECTS credits.

2.1.2 Database Systems

In this subject, the fundamental concepts of the theory and practice of databases will be studied. It will focus on aspects like design and management of databases and information retrieval. Conceptual and logical data models (Entity / Relationship Model and Relational Model) will be studied and used. In addition, the SQL language will be taught, as a language for the definition, manipulation, and database query.

In brief, the contents are the following: principles and advantages of database systems; conceptual and logical design of databases; Entity / Relationship model; Relational model; conceptual design of data models and relational databases; SQL language principles; information storage using files; basic design and management of relational databases using CASE tools.

6 ECTS credits.
2.1.3 Advanced Programming

Object Oriented Programming with C++ to develop video games. There are three main parts: Essential of C for C++, OOP in C++, Advanced C++. A game engine is developed during the course.

6 ECTS credits.

2.1.4 Statistics


6 ECTS credits.

2.1.5 Fundamentals of video game technology


3 ECTS credits.

2.1.6 Computer Graphics

Introduction to graphic pipeline (GPU, OpenGL). Introduction to global and local illumination algorithms. Introduction to OpenGL language. Introduction to shading language (GLSL). Use and implementation of textures in OpenGL. Implementation of basic illumination methods in OpenGL. Deferred Rendering and blending. Post processing techniques, including anti aliasing methods. Raytracing and global illumination in real time.

6 ECTS credits.
2.2 Second Semester

2.2.1 Graphic Architectures


6 ECTS credits.

2.2.2 Business and Video Games

The video game industry. Business models in video games. Video game companies. Video game business management and administration. Production, financial, and marketing management. Human resources management...

6 ECTS credits.
2.2.3 Introduction to Mathematical and Numerical Methods


6 ECTS credits.

2.2.4 Video Game Development Process

In this subject you will learn an introduction to the development of Video Games. Methodologies and planning of software development and adaptation to the field of video games. Software teams and processes. Requirements engineering and evaluation of quality requirements in video games.

6 ECTS credits.
3

Third Course
3.1 First Semester

3.1.1 Video Game Engineering
Software engineering, Design Patterns, Virtual worlds, Scripting languages, Specific technologies for video games, Component integration.

3 ECTS credits.

3.1.2 Game Development with Artificial Intelligence
Artificial Intelligence in the video game industry, Search problems and agents. Uninformed search, Weak Heuristic Search, Strong Heuristic Search, Multiagent and Zero-Sum Search. Machine Learning problems, Q-Learning, N-gram prediction, Decision trees and other supervised techniques.

6 ECTS credits.

3.1.3 Advanced Graphics Processors
Introduction, graphics pipeline and GPUs. General purpose programming using GPUs (GPGPU). GPU computing. Global illumination. Ray Tracing from CPU to GPU

6 ECTS credits.

3.1.4 Network Games

6 ECTS credits.
3.1.5 Human-Machine Interaction and Usability


6 ECTS credits.

3.1.6 Audiovisual Language and Interactive Media


3 ECTS credits.

3.2 Second Semester

3.2.1 Data Management in Digital Media


6 ECTS credits.
3.2.2 Algorithms for Computer Games


6 ECTS credits.

3.2.3 Sound and Music for Video Games


3 ECTS credits.

3.2.4 Characters and Scenarios


3 ECTS credits.
3.2.5 Multiplayer Environments


6 ECTS credits.

3.2.6 Virtual Reality


6 ECTS credits.

3.2.7 3D Animation

The objective of this course is to understand the creative process of 3D scenes and characters, with a focus on their animation. Students will learn animation techniques, and they will integrate them into a game engine.

6 ECTS credits.
Fourth Course
4.1 First Semester

4.1.1 Visual Design and Final Art


3 ECTS credits.

4.1.2 Character Behaviour

The course deals with the process of creating the autonomous agents of a video game. NPCs, or non-player characters are complex intelligent agents that must act according to a series of premises within a scenario. The students will study architecture and the process necessary to create a character and the artificial intelligence mechanisms that will allow it to interact with its environment and with the player.

3 ECTS credits.

4.1.3 Project Planning and Management

Fundamentals of project management, activity diagrams, Cost PERT diagrams, Gantt diagrams and project planning

6 ECTS credits.

4.1.4 Development of Applications for Mobile Devices


6 ECTS credits.
4.1.5 Web Video Games and Social Networks

Web Video Games and Social Networks This course will extend the study of the subjects Multiplayer Environments and Network Games. It will deal with the development of games in web browsers that can be visualised in different engines, the development of games on the Internet, games in Social Networks. Aspects related to the virtual economy in these games and the different business models will also be dealt with.

6 ECTS credits.