UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

SYLLABUS DEL CORSO

Foundations of Game Design

2425-2-F1801Q173

Aims

The objective of the teaching is to provide the basic conceptual and methodological tools necessary for video game design and development. The teaching illustrates the various stages leading to the creation of a video game whose design requires knowledge of programming, mathematics, human-computer interaction, communication theory, graphics, and artificial intelligence, which must be appropriately declined in the context of video games.

Contents

Starting with the concept of Game Engine, the teaching introduces the elements needed to understand the design and development stages of video games. The basics of 3D information representation necessary to understand the modeling and rendering stages will first be introduced. Then the main components of a Game Engine and their role will be described. In particular, components dedicated to rendering 2D and 3D graphics, handling animations and interactions with game elements such as collisions, and audio will be explained. The uses of artificial intelligence, interface development specific to the context of a video game will also be described. Teaching will include seminars to learn about the complex reality of the gaming industry.

Detailed program

- Introduction: what is a video game, what is a game engine
- Introduction to 2D and 3D data
- 3D mathematics for video games
- Fundamentals of video game software engineering
- Components of a game engine
- Rendering pipelines

- Assets, animations, collisions
- Artificial intelligence for video games
- Human-computer interface
- Fundamentals of gameplay
- Game industry

Prerequisites

Basic knowledge of software design, programming, computer graphics, artificial intelligence.

Teaching form

Lectures introducing theoretical concepts and exercises/workshops showing examples of the application of these concepts. Possible in-depth seminars with experts in the field.

Textbook and teaching resource

The main suggested books that help deepen the topics of the lectures/exercises are:
* Jason Gregory, Game Engine Architecture, A K Peters/CRC Press; 3° edizione
* Ian Millington, AI for Games, CRC Press; 3° edizione
* Eric Lengyel, Mathematics for 3D Game Programming and Computer Graphics, Cengage Learning, Inc

Semester

II° Year, II° Semester

Assessment method

The exam is given in project+oral form and consists of two parts:

1. **One part selected** by the student (one of options A, B, and C below, listed in increasing value with respect to possible weight on the final assessment).
   The options assess the student's ability to analyze and apply topics and issues related to video game development and design. The options are:

A) Seminar (individual) on topics covered in class (theory + exercises).

B) Seminar (individual) on topics not seen in class: scientific articles, technical reports, etc.. related to the world of video games.

C) Implementation (in groups max 3 people) of a small project.

The topic of the seminar or project must be agreed in advance with the lecturers.

2. **Oral** with free questions on the course content or exercises left in class in order to assess the final exam grade.

Office hours

On appointment

Sustainable Development Goals

INDUSTRY, INNOVATION AND INFRASTRUCTURE