UNIVERSITÀ
DEGLI STUDI DI MILANO-BICOCCA

COURSE SYLLABUS

Foundations of Game Design

2526-2-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.

Knowledge and Understanding
Knowledge of the fundamental concepts related to the design and development of video games.
Understanding of the main techniques and algorithms that constitute the core components of video game creation.

Applying Knowledge and Understanding
Ability to apply theoretical knowledge to the design and development of a video game.
Ability to analyze and understand the technical and design solutions adopted in existing video games and their purposes.
Ability to use Unity to implement basic components of a video game.

Judgment and decision-making
Ability to identify the different stages of the video game development process and to select the most appropriate techniques for the specific context.

Communication Skills
Ability to present and discuss the design and implementation of a video game, or of its specific components, both from a theoretical and a practical perspective.

Learning Skills
Ability to independently explore and deepen advanced aspects of video game development.

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. **Project** Implementation (max. 3 persons) of a small project related to video games. The project assesses the student's ability to analyse and apply topics and issues related to the development and design of video games. The topic of the 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