The City College Of New York STEM Institute

Game Design and Development Syllabus

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Class Hours: 2 hours and 30 minutes per day, Tuesday and Thursday, 4PM - 6:30PM, from September 16th until December 16th. The class runs for 2 hours with a 30 minute extension for any help needed.

Materials:
A modern computer capable of running the Unity, and Visual Studio software. Windows, Mac, and Linux are compatible with the Unity Game Engine, however, Windows and Mac are highly recommended due to the limitations of Visual Studio on Linux platform.

Minimum requirements	Windows	macOS	Linux (Support in Preview)
Operating system version	Windows 7 (SP1+) and Windows 10, 64-bit versions only	High Sierra 10.13+	Ubuntu 16.04, Ubuntu 18.04, and CentOS 7
CPU	X64 architecture with SSE2 instruction set support	X64 architecture with SSE2 instruction set support	X64 architecture with SSE2 instruction set support
Graphics API	DX10, DX11, and DX12-capable GPUs	Metal-capable Intel and AMD GPUs	OpenGL 3.2+ or Vulkan-capable, Nvidia and AMD GPUs.

Course Textbook: Unity Game Development in 24 Hours by Mike Geig 4th Edition

Supporting Resources:
Unity User Manual - https://docs.unity3d.com/Manual/index.html
Unity YouTube Channel - https://www.youtube.com/c/unity

Course Description:
This is an in-depth introduction to the fundamentals of game design and development. Using the industry leading tools and techniques, students will learn how to assemble fully functional 2D and 3D games. Topics include: game industry roles, standard game engine tools, programming in C#, creating visual effects and animations, and more. Accumulating in a final project where the students create their own games.

Instructional Goals and Purpose:
The purpose of this course is to provide students with the knowledge of the game development industry and the many roles that go into it by providing them skills necessary for translating ideas into playable games, while preparing them for further study in the fields of engineering and design.

Attendance:
It is very important that students attend every class session to ensure not falling behind progressive material. Attendance will be taken immediately at the beginning of each class, so please advise the STEM office of an unexpected absence.

Class Rules and Professionalism:
Show up on time and be respectful. Noise and excessive chatter, eating, drinking, or use of unauthorized electronic equipment is not allowed in the classroom. Academic integrity is an essential part of the pursuit of truth, and of your education. We are all responsible for maintaining professionalism and academic integrity at the STEM Institute, it is the rock on which the value of your degree is built.

Learning Objectives:
- Engineering & Design - Analytical and Problem Solving skills
    - Proof of concept(s), barriers and solutions, test driven development
    - Human computer interaction, affordance, design thinking
- Coding & Visual Scripting - Object-Oriented Programming Foundations
    - Variables, functions, events, flow control, sequencing, debugging
    - Inheritance, encapsulation, polymorphism, abstraction
- Mathematics & Art - 3D Vector math, movement patterns and animation curves
    - Collision detection, physical forces, linear interpolation
    - Level design, 3D geometry, landscaping terrain, materials and textures
- Storytelling & Theory - Pairing conflict and resolution with a player outcome
    - Storyboards, story cycle, crafting tension
    - Artificial intelligence, meaningful choice, player agency

Grading Rubric

Homework & In Class Labs (20% & 30% respectively) Students will have one homework assignment a week, given on Thursday due Tuesday that will be practice for the Tuesdays Lab. Labs will be done after we cover a core subject and will consist of the students creating a small game focused around the discussed topic allowing them to create different games and obtain the knowledge that will prepare them for the final project.

Final Project (50% total) Students will work in groups of two to three to create a final project demonstrating a small game. The goal is to combine the course material in a creative manner, by engineering game interactions and solving problems that arise during game design and development. Each final project must have at minimum:

- Working menu with a title that can switch to your own level(s), and working credits screen that is either accessible from the title screen or that the game plays at the end of the experience.
- Completed level(s) with a function game loop with goals and fail states.
- Animations, visual and audio effects to call attention as feedback about an interaction.

Weekly Course Outline:

Week 1 (September 19th & September 21st) - Introduction To Game Development

- September 19th - First day of class, going over syllabus and game development history.
- September 21st - Introducing the software and how to use it through the class.

Week 2 (September 26th & September 28th) - Introduction to Unity and 3D Game Development

- September 26th - Creating 3D Objects, Using Physics and Creating Assets
- September 28th - Creating 3D levels.

Week 3 (October 3rd & October 5th) - Introduction to 2D Game Development

- October 3rd - 3D Lab, students will create a 3D platforming game.
- October 5th - Introduction to 2D game design, going over 2D physics and tilemaps.

Week 4 (October 10th & October 12th) - User Interface Development

- October 10th - Introduction to UI interfaces
- October 12th - 2D and UI Lab

Week 5 (October 17th & October 19th) - C# Fundamental Continuation

- October 17th - Introduction to C# Programming Fundamentals
- October 19th - Continuation of C# Programming Fundamentals

Week 6 (October 24th & October 26th) - Programming In Conjusnity with Untiy

- October 24th - C# in Conjunction with Unity Objects
- October 26th - Programming Lab

Week 7 (October 31st & November 2nd) - Introduction To Animation, Lighting and Audio

- October 31st - Introduction To Animation, Lighting and Audio
- November 2nd - Animation, Lighting and Audio Lab

Week 8 (November 7th & November 9th) - Game Development Guest Speaker

- November 7th - Election Day - No Class
- November 21st - Guest Speaker from Games Industry

Week 9 (November 14th & November 16th) - Creating a Game: Flappy Bird

- November 14th - Creating Flappy Bird
- November 16th - Creating Flappy Bird

Week 10 (November 21th & November 23rd) - Game Development

- November 21st - Creating a Game Design Document
- November 23rd - Thanksgiving - No Class

Week 11 (November 28th & September 30th) - Game Development

- November 28th - Students Develop Their Final Project
- November 30th - Students Develop Their Final Project

Week 12 (December 5th& December 7th) - Game Development

- December 4th - Students Develop Their Final Project
- December 6th - Students Develop Their Final Project
- December 9th - Grades Are Submitted

Week 13 (December 12th & December 14th) - Wrapping Up the Semester

- December 12th - Practicing Presenting The Project
- December 14th - What To Do With Your New Learned Skills