



The City College Of New York STEM
Institute

Game Design and Development
Syllabus

Instructor: Sebastian Grygorczuk

Email: #####

TAs: Mr. Haotian Gan, and Mr. Kenneth Wu

Emails: #####, #####

Class Hours: 3 hours per day, Monday through Friday, 1PM - 4PM, from July 6th until August 18th.

Hybrid Class: This is a Hybrid class with scheduled three in person days, Monday, Wednesday, and Friday and two online days Tuesday, and Thursday.

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 & Quizzes (30% & 20% respectively) Students will have an assignment twice a week, one given on Monday due Wednesday and one given on Wednesday due Friday. The goal of the assignment is to practice the concepts presented from the class. Sometimes that involves posting work in a respectable manner and providing criticism in a positive fashion.

Students will take four quizzes, one every week for the first four week for every subject covered. The goal of the quiz is to demonstrate what has been learned from the weekly in class experiments and homework assignments. More details will be provided during class.

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 - Design

Day 1	Introduction and Game Industry Roles
Day 2	Familiarizing with Unity and Game Objects
Day 3	Creating Prefabs and 3D Level
Day 4	Creating a 2D Level

Week 2 - Programming

Day 1	Learning Fundamentals of C#
Day 2	Using C# to Create Scripted Game Objects
Day 3	Visual Scripting and UI
Day 4	Programming a Game Level

Week 3 - Game Visual Effects

Day 1	2D and 3D Animation
Day 2	Audio and Lighting
Day 3	Particle Effects and Camera
Day 4	Creating a CutScene

Week 4 - Demo Project

Day 1	Creating a Game Design Document and Prototyping
Day 2	Implementing Level and Use AI Navigation
Day 3	Debugging and Polishing
Day 4	Final Product

Week 5 - Game Development

Day 1	Forming Groups and Brainstorming Game Ideas
Day 2	Prototyping Game
Day 3	Presentation of Game Concept
Day 4	Creating the Game

Week 6 - Game Development

Day 1	Creating the Game
Day 2	Bug Fixes and Polishing
Day 3	Uploading the Game and Hooking Viewer
Day 4	Final Presentation and Q+A

Weekly Student Deliverables:

Week 1 - Geometry & Physics

- Custom made geometry textured with a unique material (Brick, Wood, Stone, Water, etc.)
- 3D mockup of any structure (House, Room, Castle, Cannon, etc.)
- 3D Terrain level with intractable obstacles
- 2D Tilemap level with intractable obstacles and objectives.

Week 2 - Coding & Scripting

- Programming fundamentals
- New interactable prefabs with player resource management
- New HUD prefabs with pop-up text that tells a story during play events

Week 3 - Audio & Animation

- Lighting and camera controls
- Use of particle effects and audio cues for player feedback
- A cutscene of using rigged and animated character

Week 4 - Game Theory & Storytelling

- New game prototype of a simple demo
- New AI navigation pathfinding
- Storyboard with unique concept and details about interaction or purpose

Week 5 - Game Production

- New menu with play button, quit button, and credits button with toggled information
- Final game prototype featuring your own core mechanic and paired conflict
- Technical document page written about your own mechanic and concept(s)

Week 6 - Game Presentation

- Portfolio packed with screenshots of your progress
- Game featuring a menu, a level with clear goal, a player ability, and conflict demonstrated