Game Development 1

Course Syllabus

Game Development 1 Syllabus

General Overview

Game Development 1 introduces foundation game design and development while teaching students to build games and simulations using Unity, C#, and Blender 3D. Game Development 1 takes a holistic approach to learning and game development.

At the end of this course, students are able to design and develop games from scratch, design and coding their own new features, and creating their own 3D models. Game development 1 focuses on industry preparedness.

Students will be able to communicate across multiple disciplines and gain an understanding of the different roles, responsibilities, and practices of the game development industry.

Course Objectives

Upon completion of this course, student will be able to

- Use Unity to create 2D and 3D games and simulations.
- Write clean and efficient Object-Oriented C# code.
- Design and implement new features and game mechanics.
- Identify and follow industry standard best practices.
- Create game ready 3D models using Blender 3D.

Mission and Goals

In accordance with the Mission of Mastery Coding, the faculty, staff, and students understand and declare our purpose to be the encouragement of life-long learning, academic excellence, the education of the whole person, and future readiness in a world changed by technology.

Value and respect for all individuals

We believe in the worth of each individual. We affirm the inherent dignity and value of each person. Therefore, we believe that all individuals have the potential to be successful learners with unique characteristics and experiences that bring positive value and meaning to the learning experience.

All students will be:

- Offered a challenging learning experience that will help to maximize their individual achievement and provide meaningful opportunities for students to excel
- Offered diverse instructional suggestions and strategies that address the specific needs of the United State's diverse population
- Provided a clear instructional goal
- Afforded an instructional program that preserves the balance of conceptual understanding and problem solving of the subject area.
- Provided the learning in each instructional year that lays the necessary groundwork for success in subsequent years of study
- Provided a learning environment that fosters a genuine understanding and confidence in all students that through hard work and sustained effort, they can achieve or exceed the learning objectives
- Provided a cogent balance theory, research, and practice.

Develop moral, intellectual, responsible, and caring citizens

We are committed to the preparation of students who will be exemplars in the field, and who reflect high standards of ethics and values. We seek to be, and to encourage others to be, people who have the intellectual skills to critically evaluate important issues, have the moral conviction to respond as agents of change, and exhibit an ethic of care in the service of others.

Grading Scale

93.0%-100%	A
90.5%-92.9%	A-
88.0%-90.4%	B+
85.0%-87.9%	B
80.0%-84.9%	B-
78.0%-79.4%	C+
71.0%-77.9%	C
69.5%-70.9%	C-
68.0%-69.4%	D+
61.0%-67.9%	D
59.5%-60.9%	D-
0 - 59.4%	F

**The instructor retains the right to make changes, additions or deletions to the syllabus during the course of the learning period.*

Course Breakdown

Unit 1: Unity Interface

Students learn how to navigate the Unity interface by creating and manipulating GameObjects and prefabs to build their own game levels and simulations.

Learning Objectives

By the end of this unit, students will be able to

- Identify and distinguish key features of the Unity Editor Interface.
- Identify the core architecture of the Unity game engine.
- Design and develop 3D environments in Unity.
- Use the Unity Physics system to build in-engine physics simulations.
- Identify the core features of Unity script components and use provided scripts to implement core gameplay and functionality.

Chapters

- Chapter 1: Introduction to Unity
    - Course Introduction
    - Unity Interface
    - GameObjects
    - Prefabs
- Chapter 2: Components
    - Camera Components
    - 3D Models
    - Neighborhood Scene
    - Script Components
    - Collision Detection
- Chapter 3: Physics
    - Materials and Textures
    - Rigidbodies
    - Physic Materials
- Chapter 4: Collectibles
    - Trigger Colliders
    - Particle Systems
    - Animating GameObjects

Unit 2: Introduction to C#

In this unit students learn the fundamentals of C# and Object-Oriented programming and start programming scripts.

Learning Objectives

By the end of this unit, students will be able to:

- Read and write C# code.
- Write code using Variables and Assignment.
- Employ control structures.
- Write code to create and iterate through arrays of objects and primitive data types.
- Identify the core principles of Object-Oriented Programming.

Chapters

- Chapter 1: Variables and Operators
  - Hello World
  - Variables and Assignment
  - Operators
- Chapter 2: Conditionals
  - Conditionals
  - Conditionals pt2
  - Nested Conditionals
- Chapter 3: Loops, Arrays, and Iteration
  - While Loops
  - For Loops
  - Arrays
  - Arrays pt2
- Chapter 4: Object-Oriented Programming
  - Methods
  - Classes and Objects
  - Object Oriented Programming

Unit 3: Unity Scripting API

In this Unit, students combine the understanding of Unity and C# and use the Unity Scripting APi (Application Programming Interface) to program their own game from scratch.

Learning Objectives

By the end of this unit, students will be able to:

- Use an API to design and implement features using C#
- Read and understand the Unity Scripting API
- Use the Unity Physics API to script physics simulations
- Load and Manage multiple scenes
- Design new levels using Unity's Terrain system

Chapters

- Chapter 1: MonoBehaviour API
    - API Application Programming Interface
    - MonoBehaviour
    - Vectors
    - User Input
    - Rigidbody API
- Chapter 2: Projectiles
    - Projectiles
    - Instantiate
    - Animation State Machine
    - Explosions
- Chapter 3: Game Mechanics
    - FindObjectOfType
    - User Interfaces
    - Load Scene
- Chapter 4: Terrain
    - Terrain and Level Design

Unit 4: Unity 2D

In this Unit students will apply the skills learned in previous Units to focus on 2D game development techniques.

Learning Objectives

By the end of this unit, students will be able to:

- Identify the differences between 2D and 3D game development.
- Use the Unity Scripting API to implement 2D physics and game mechanics.
- Practice program structure and design best practices.
- Learn about industry standards for project polish and performance optimization.

Chapters

- Chapter 1: 2D Game Development
    - Sprites and Sprite Renderers
    - Sprite Sheets
    - Physics 2D
    - OnCollisionEnter2D
    - Spawning
- Chapter 2: Program Structure and Design
    - Static Modifier
    - Parallax Layers
    - Player Health
    - Design Patterns: Singleton
    - Enumeration Types
- Chapter 3: Implementing Art and UI
    - Sprite Animations
    - Animation Events
    - Player UI
    - Unity UI: Buttons
- Chapter 4: Polish and Performance
    - Score
    - PlayerPrefs
    - Object Pooling
    - Game Feel

Unit 5: 3D Modeling with Blender

In this unit students learn the key principles of 3D modeling with Blender 3D.

Learning Objectives

By the end of this unit, students will be able to:

- Identify the functionality of 3D models.
- Create 3D models using Blender 3D.
- Employ 3D modeling best practices for project management.
- Create game-ready and optimized 3D models.

Chapters

- Chapter 1: Introduction to Blender
  - 3D modeling and Blender
  - Blender Setup
  - Objects and 3D viewport
- Chapter 2: Mesh Editing
  - Edit Mode
  - Extruding and Insetting
  - Knife and Loop Cuts
- Chapter 3: Modeling Tools
  - Project Management
  - Modifier Overview
  - Pipeline Tools
  - Importing and Exporting
- Chapter 4: Materials and Textures
  - Introduction to Materials
  - UV Mapping
  - Lights, Camera, Reflection!
  - Render and Output
- Chapter 4: Creating a Scene
  - Architecture
  - Furniture
  - Props
  - Staging the Scene
  - Creating compositions
- Chapter 6: Medieval Assets

Unit 6: Unity Events and Interactions

In this unit students will practice developing complex interlocking systems in C# and identify level design, and asset pipeline best practices.

Learning Objectives

By the end of this unit, students will be able to:

- Employ more advanced C# programming and program design techniques to implement intricate interconnected systems and scripts.
- Write C# code using events and listeners.
- Use the Unity Scripting API to model complex systems.
- Identify game asset pipeline best practices.

Chapters

- Chapter 1: Level Design
    - Models and Materials: Export / Import
    - Building Levels
    - Level Design
    - Lighting in Unity
- Chapter 2: Player Controller
    - Player Camera Setup
    - Player Movement
    - Player Input
- Chapter 3: Player Interactions
    - Player Interactions
    - Interaction Objects
    - Unity Events
    - Creating Interactions
    - Scripting Interactions
- Chapter 4: Player Objectives
    - Player Objectives
    - Player Objectives pt 2
    - Game Manager

Unit 7: Data Structures

In this unit students learn the fundamentals of data structures and the C# collections library, and how to use them to create a tower defense game.

Learning Objectives

By the end of this unit, students will be able to:

- Identify and implement different fundamental data structures including Lists, Arrays, Dynamic Arrays, and Dictionaries.
- Identify prototyping and design best practices.
- Design system architecture to support code reuse and efficiency.
- Employ industry standard UI/UX design principles to design an intuitive and engaging user interface.

Chapters

- Chapter 1: Introduction to Data Structures
  - What is a Data Structure?
  - Dynamic Arrays
  - Collections
  - Generics
- Chapter 2: Tower Defense Prototype: Grid, Path, Enemies
  - Prototype Design
  - Grids
  - Pathing
  - Enemies
  - Coroutines
- Chapter 3: Tower Defense Player Design and Implementation
  - Player Design
  - Player Cursor
  - Towers
  - Towers pt 2
  - Scriptable Objects
  - Tower Animations
  - Player Script
- Chapter 4: Tower Defense User Interface
  - Designging User Interfaces
  - Designging UI Icons
  - Scripting UI

Unit 8: Capstone Project

In this unit students will design and develop a game idea of their own from scratch. Throughout this unit students will design and develop an idea and game design document, solicit feedback from peers, and then prototype and build the final product in Unity.

Learning Objectives

By the end of this unit, students will be able to:

- Identify the different phases of the game development process.
- Design, prototype an original game idea from start to finish.
- Develop industry preparedness and awareness.
- Present and pitch game ideas and designs.
- Solicit and respond to feedback from peers.

Chapters

- Chapter 1: Planning and Design
  - The Game Development Life Cycle
  - Game Genre and Mechanics
  - Game Loops
- Chapter 2: Pre-Production
  - Grayboxing with ProBuilder
  - Console Window and Debug Logs
  - Version Control
- Chapter 3: Production
  - Unity Asset Store
  - Curve Editor
  - Rendering Pipelines
- Chapter 4: Launch
  - Build and Publish