Carnegie Mellon University

98127 - Student Taught Courses (StuCo):

Introduction to Game Development in Unity

Tuesday, 7:00pm - 8:50pm, Location: DH 1112

Semester: Spring **Year:** 2026 **Units:** 3 **Type:** StuCo

Instructor(s) information

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Course Description

- This course is intended to be the definitive introduction to the Unity game engine. Students will learn all the major skills necessary for game development, from scripting, asset pipelines to sound integration among others, and leave the course with sufficient foundation to confidently pursue more advanced topics in any specialization of their choice related to game development in Unity. This course is, however, **NOT** a game design course, and **will not** go into topics such as design documents, scoping, character, environment, level or narrative design.
- There are no hard prerequisites for this course, but we highly recommend having a programming background, such as having taken 15112 - Fundamentals of Programming, as some classes will be programming heavy.

- Classes will be lecture and lab based. Each class will begin with a lecture covering the concepts being taught, then a short break before the instructors demonstrate how to apply what was taught in Unity, which students can follow along.
- **Course website**: https://www.gamecreation.org/course

Learning Objectives

Upon successful completion of this course, students should be able to:

- Understand the role of common windows in the Unity Editor, including but not limited to the Scene, Project, Console, Game, Hierarchy and Inspector windows.
- Explain what an entity component system is and how it differs from object oriented programming.
- Build custom components to drive gameplay behaviour by inheriting from Unity's Monobehaviour class and accessing other built-in Unity components such as the Transform, Rigidbody or Collider components.
- Create, import and implement assets with animations, both 2D and 3D.
- Create custom shaders and visual effects using Unity's Shader Graph package and ParticleSystem component
- Implement sound using FMOD and Unity's built-in sound system

Additional Materials

- Students are expected to attend class with a device, such as a laptop, capable of running Unity.
- This course will require students to download free software for use in certain assignments or lectures.

Attendance Policies

- Students are expected to attend every class. Students that have more than 2 unexcused absences will **automatically fail the course**. This is a strict policy. Students with legitimate reasons to miss class should inform the instructors in advance as soon as possible.
- Attendance will be taken in the middle of class, after the lecture component but before the lab component.
- Attending a significant portion of class but being unable to be present for attendance counts as an excused absence. Illness, job interviews and travel are also other accepted reasons. Whether or not other reasons are accepted for excused absences is up to the discretion of the instructors.

Assessments

The final course grade will be calculated using the following categories:

Assessment	**Percentage of Final Grade**
Participation	28%
Assignments	40%
Final Project	32%

- **Assignments**: The purpose of the assignments is to have students build up the foundations for the final project early. As such, students are highly encouraged to complete each assignment within the **same** Unity project. Students are expected to submit a **screen recording** showcasing the implemented behaviour in-game. **Each assignment is worth 10%** of your final grade. Details are as follows:
  - Assignment 1 - Player Controller: Implement a basic player controller that supports moving, jumping

and falling, as well as a camera that follows player movement
    - Assignment 2 - Asset and Animations: Replace your placeholder player asset with a sprite/model of your creation and extend your player controller to correctly play idle, moving, jumping, falling and landing animations. You will be required to either create your own animations or figure out how to import animations and have it work with your asset.
    - Assignment 3 - Sound: Add footsteps, jumping and landing sounds to your player controller. You are required to create your own audio assets.
    - Assignment 4 - UI: Implement a menu screen and pause screen.
- **Final Project**: On top of what has been implemented in the assignments, students are expected to implement **2 additional features** of choice from a provided list. Everything should then be consolidated and extended into a playable game. Students have the option of either designing their own game or implementing a design provided by the course. Students are expected to submit a **build of their game** as well as a short writeup describing the additional features they've chosen to implement.
- All work is expected to be completed **individually.**

Students will be assigned the following final grades, based on calculations coming from the course assessment section.

Grade	Percentage Interval
P	60-100%
R (F)	0-59%

Grading Policies

- Assignments and final project will be graded based on **completion**, not quality. Detailed rubrics for each will be provided as each assignment is released.
- **Late-work policy**: **No late-days will be provided**. Instead, for every day that a submission is late, you will incur a 10% grade penalty for that assignment. **No submissions are allowed past the last day of classes**.
- **Re-grade policy**: To request a regrade, contact an instructor within one week of receiving the graded assignment with an explanation of what was wrongly graded. This includes if you believe you've been wrongly docked attendance.
- **Attendance policy**: Having your attendance taken counts for 2% of your final grade each class.

Course Schedule

Date	Topic	Logistics
1/13/2026	**Introduction to Course and Unity** We will briefly go over the syllabus before introducing how to install, use and navigate the Unity Editor. We will discuss how Unity uses ECS (Entity Component System) to define in-game behaviour, and how you can write your own components by inheriting from Unity's Monobehaviour class.	
1/20/2026	**Basic Scripting** We will learn the steps to programming simple game mechanics via implementing a basic player controller. Along	Assignment 1 Out

	the way, we will touch upon Unity's Input System, camera controls using the Cinemachine package, and collision detection and handling.	
1/27/2026	**3D Asset Pipeline** We will learn the basics behind how to create, UV unwrap, texture, and rig models in Blender, how to import and animate the assets in Unity, and how to control animations with scripting using Unity's Animator Controller.	
2/3/2026	**2D Asset Pipeline** We will learn how to import images as sprites to Unity and create animations using sprite sheets or 2D rigging, as well as how to use tilemaps to build levels.	Assignment 1 Due Assignment 2 Out
2/10/2026	**Shaders and VFX** We will discuss a basic overview of the render pipeline, and teach how to write your own custom materials using Shader Graph. We will also teach how to use Unity's particle system to create basic visual effects such as fire.	
2/17/2026	**Sound** We will learn the basics of sound waves and processing in Reaper, and implement sounds in Unity. We will take the time in class to integrate in FMOD and learn game parameter-based audio events.	Assignment 2 Due Assignment 3 Out
2/24/2026	**UI, Lighting and Postprocessing** We will learn the basics of 2D and 3D lighting alongside UI for interactable buttons and scene changes. We will learn postprocessing techniques such as bloom and blur effects.	Assignment 3 Due Assignment 4 Out Final Project Out
3/3/2026	**Spring Break - No Classes**	
3/10/2026	**Intermediate Scripting** We will learn how to use coroutines and UniTask for asynchronous programming. We will also learn how to use, scriptable objects, interfaces and abstract classes, custom editors and attributes	Assignment 4 Due
3/17/2026	**Procedural Animation** We will learn about inverse kinematics and common constraints used in procedural animation and demonstrate some use cases using Unity's Animation Rigging package.	
3/24/2026	**Advanced Player Controller** We will cover a collection of techniques used by developers to create a more responsive and enjoyable player controller, including speed adjustments for slopes, stairs, input buffering, jump cuts and more.	

3/31/2026	**Enemy AI** We will explore how to use behaviour graphs in Unity to drive enemy decision making as well as cover common pathfinding implementations such as NavMesh.	Final Project Checkpoint
4/7/2026	**Programming Patterns** We will cover useful ways to structure your code, a.k.a. programming patterns, such as Singleton, Observer, and Flyweight, and the scenarios where their use is helpful.	
4/14/2026	**Networking** We will cover frame synchronization and state synchronization for Unity using Netcode for GameObjects.	
4/21/2026	**World Streaming** We will introduce two common techniques used to optimise large open world terrain, world partitioning and world streaming, and cover the implementation of the latter in greater detail.	Final Project Due

Remote Teaching

- Classes will be livestreamed and recorded on Zoom.
- Virtual participation is only permitted for students that are not currently located on campus (e.g. travelling for events). Students whom this applies to should reach out to an instructor as soon as possible to discuss which days they will attend virtually. If approved, the student can gain participation credit by attending the livestream synchronously.

Course Note

Academic Integrity & Collaboration: *From CMU's Policy on Academic Integrity:* In any manner of presentation, it is the responsibility of each student to produce her/his own original academic work. Collaboration or assistance on academic work to be graded is not permitted unless explicitly authorized by the course instructor(s). Students may utilize the assistance provided by Academic Development, the Global Communication Center, and the Academic Resource Center (CMU-Q) unless specifically prohibited by the course instructor(s). Any other sources of collaboration or assistance must be specifically authorized by the course instructor(s).

In all academic work to be graded, the citation of all sources is required. When collaboration or assistance is permitted by the course instructor(s) or when a student utilizes the services provided by Academic Development, the Global Communication Center, and the Academic Resource Center (CMU-Q), the acknowledgement of any collaboration or assistance is likewise required. This citation and acknowledgement must be incorporated into the work submitted and not separately or at a later point in time. Failure to do so is dishonest and is subject to disciplinary action.

Instructors have a duty to communicate their expectations including those specific to collaboration, assistance, citation and acknowledgement within each course. Students likewise have a duty to ensure that they understand and abide by the standards that apply in any course or academic activity. In the absence of such understanding, it is the student's responsibility to seek additional information and clarification.

Accommodations for students with disabilities: If you have a disability and have an accommodations letter from the Disability Resources office, I encourage you to discuss your accommodations and needs with me as early in the semester as possible. I will work with you to ensure that accommodations are provided as appropriate. If you suspect that you may have a disability and would benefit from accommodations but are not yet registered with the Office of Disability Resources, I encourage you to contact them at access@andrew.cmu.edu.

Statement on student wellness: This semester is unlike any other. We are all under a lot of stress and uncertainty at this time. Attending Zoom classes all day can take its toll on our mental health. Make sure to move regularly, eat well, and reach out to your support system or Judy Hallinen [hallinen@cmu.edu] if you need to. We can all benefit from support in times of stress, and this semester is no exception. If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support. Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at http://www.cmu.edu/counseling/. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help.

Statement on Diversity, Equity, and Inclusion: We must treat every individual with respect. We are diverse in many ways, and this diversity is fundamental to building and maintaining an equitable and inclusive campus community. Diversity can refer to multiple ways that we identify ourselves, including but not limited to race, color, national origin, language, sex, disability, age, sexual orientation, gender identity, religion, creed, ancestry, belief, veteran status, or genetic information. Each of these diverse identities, along with many others not mentioned here, shape the perspectives our students, faculty, and staff bring to our campus. We, at CMU, will work to promote diversity, equity and inclusion not only because diversity fuels excellence and innovation, but because we want to pursue justice. We acknowledge our imperfections while we also fully commit to the work, inside and outside of our classrooms, of building and sustaining a campus community that increasingly embraces these core values.

Each of us is responsible for creating a safer, more inclusive environment.

Unfortunately, incidents of bias or discrimination do occur, whether intentional or unintentional. They contribute to creating an unwelcoming environment for individuals and groups at the university. Therefore, the university encourages anyone who experiences or observes unfair or hostile treatment on the basis of identity to speak out for justice and support, within the moment of the incident or after the incident has passed. Anyone can share these experiences using the following resources:

- Center for Student Diversity and Inclusion: csdi@andrew.cmu.edu, (412) 268-2150
- Report-It online anonymous reporting platform: reportit.net username: tartans password: plaid

All reports will be documented and deliberated to determine if there should be any following actions. Regardless of incident type, the university will use all shared experiences to transform our campus climate to be more equitable and just.