



# XR Development with Unity

TRAINING PROGRAM



In partnership with Circuit Stream

# Curriculum Overview

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In the 10-week XR Development with Unity course, you will learn to create VR and AR applications using Unity, C#, and industry-standard tools for developing XR applications. The course will cover the foundational skills in XR development and design.

## Course Structure

### **LIVE SESSIONS**

3 hour weekly live and online sessions split twice a week for 1.5 hours each.

### **OFFICE HOURS**

Each week, 5 Office Hour time slots of 1 hour will be offered. You can use the time to drop in and meet with instructors to: ask any questions you have to help work through specific problems or expand on bigger questions about the course or the industry.

### **ASSIGNMENTS**

You will work on project assignments and quizzes. The basic assignments will help prove your understanding of the material, while more advanced assignments will help push you to your creative limits.

## Completion Requirements

Students must attend at least 70% of the live sessions to be eligible for the Certification.

## Course Outcomes

By the end of this course, you will be able to:

- Create your own VR or AR idea in Unity
- Design for different XR platforms
- Manage production of XR projects
- Analyze the technical feasibility of XR projects
- Collaborate in teams working with Unity
- Leverage a powerful network in the XR industry






## Who is this course for?

**This is a beginner-friendly course, with no previous experience required.**

This course is equally applicable to developers as it is to generalists looking to better understand and work with this technology. It is designed for students or professionals coming from a wide range of backgrounds with an interest in working with immersive technologies.

## How to Apply

**Get started by choosing a curriculum bundle option:**

	WHAT IT INCLUDES?	PRICE
STARTER	 XR Development with Unity COURSE • 10 WEEKS   Unity Certification Exam	\$3,950
PLUS	Everything in Starter plus:  C# Scripting Fundamentals COURSE • 4 WEEKS   Oculus Quest 2   10 hours 1:1 with expert	\$4,950

# Breakdown

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## SECTION 1

### Introduction to Unity

Welcome to the XR Development course, in this first section we'll go over the basics. We'll cover navigating the editor for all the beginners and throw in some helpful tips along the way for the more advanced ones.

Then we'll move on to manipulating objects in the scene, making them pretty with materials, saving them with prefabs, modifying them with ProBuilder, and even importing them from the asset store. No code, just the sound fundamentals of working with assets in the editor that every project needs!

## LESSON 1

- Manage project with the Unity Hub
- Identify and make use of essential features of the Unity Editor
- Create and make use of Game Objects in a scene
- Manipulate coordinates in local and global axes
- Create basic material

## LESSON 2

- Create and modify prefabs
- Prototype with ProBuilder
- Get assets from the Asset Store
- Import assets
- Configure and use a character controller

## SECTION 2

# Programming in Unity with C#

In this section, we will be creating a simulation of a Solar System, with orbiting planets and moons around a star. We will learn how to animate these celestial bodies in code as well as create a physics-controlled rocket ship to explore our little patch of space. We'll learn how to fire laser bolts from our ship to further explore how to interact with objects using physics.

## LESSON 3

- Understand the key concepts of MonoBehaviour in Unity
- Implement basic variables with basic Data Types, with access modifiers
- Serialize variables in the Inspector
- Implement Functions, Methods, and Properties
- Implement Time Handling
- Implement 3D transformations with the Transform class

## LESSON 4

- Implement Point Lights
- Implement Conditional Statements
- Implement Input Handling
- Find game objects and components in a Scene
- Add Forces and Torque to Rigid Bodies

## LESSON 5

- Instantiate GameObjects dynamically
- Destroy Game Objects dynamically
- Implement Rigid Body velocities
- Implement Rigid Body impulses
- Implement Collision Detections
- Play sound effects

## **SECTION 3**

# **Introduction to AR with Vuforia**

In this section, we will learn how to create an Augmented Reality application using Vuforia. We will use multiple Image Targets to build an X-Ray simulator, where we can scan a Human Body 3D model in AR to see what's inside. Along the road, you will get familiar with the Unity UI System and components.

## **LESSON 6**

- Import Packages with the Unity Package Manager
- Identify key aspects that make good image targets
- Implement Image targets with Vuforia
- Work with simultaneous multiple Image Targets
- Implement simple shaders

## **LESSON 7**

- Version control with Git and Github
- Understand the key concepts about World Space and Screen Space
- Implement flexible UI Elements
- Implement various UI Events within the Inspector

## SECTION 4

# Introduction to VR in Unity

In this section, we will create our first VR experience. We will make use of the advanced Unity physics engine to create a realistic skill-based game involving throwing various foodstuffs at moving targets. Along the way, we'll learn how to use the animation system to animate our VR hands and detect collisions to allow us to pick up our projectiles and throw them realistically at our randomly generated targets. Food fight!

## LESSON 8

- Convert the Camera to an XR Rig
- Implement a simulated hand script for VR
- Implement a State Machine with Animator
- Setup VR Controllers in the Input Manager
- Implement Animation parameters
- Handle Triggers

## LESSON 9

- Implement Kinematic grabbing
- Implement Fixed Joint grabbing
- Grabbing and throwing objects
- Handling Collisions

## LESSON 10

- Write code to handle animations
- Calculate random positions
- Implement Object Tags
- Implement Audio Sources
- Implementing Worldspace UI
- Create a Timer with `Time.deltaTime`
- Implementing a scoring system

## SECTION 5

# Implementing VR Locomotion

It's time to get moving! In this section, we'll create the classic VR teleport with all the UX bells and whistles from scratch! We'll go over Layers and Layer Masks, the all-powerful Raycast, Line Renderers, and Coroutines so we can have our very own VR Locomotion system! There will be a bit of math to cover with Lerp and Dot products but we'll make sure they're understandable and become powerful tools for you!

### LESSON 11

- Implement Layers and Layer Masks
- Implement Physics Raycast
- Implement Line Renderers
- Implement Custom Input Axis

### LESSON 12

- Implement Coroutines
- Understand the key concepts of Vector Math
- Calculate Linear Interpolation
- Calculate Dot and Cross products
- Implement Snap Rotation

## SECTION 6

# Implementing VR Interactions

In this section, we will rebuild a simplified version of the acclaimed Tilt Brush in VR. Now that you master the basics, it is time to use some advanced C# and Unity techniques to create some advanced interactions with buttons, levers, and dials. Your room is your canvas!

## LESSON 13

- Implement Abstract Classes
- Implement Inheritance
- Implement Polymorphism
- Work with Collections
- Implement Iteration Statements

## LESSON 14

- Implement Configurable Joints
- Implement Custom Interactions
- Implement 3D Buttons
- Implement 3D Dials
- Implement 3D Levers

## SECTION 7

# Introduction to AR Foundation

In this section, we'll be learning how to use AR Foundation to create an AR robot that dodges enemies and navigates around your living room. Our AR robot will navigate using touch controls, and we'll be using image tracking to spawn enemies.

## LESSON 15

- Understand the key concepts of the XR Stack in Unity
- Implement Plane Tracking
- Implement AR Raycast
- Import Mixamo Animations

## LESSON 16

- Implement Navmesh and Waypoint navigation
- Implement Mobile Input
- Configure the Project for Mobile Targets
- Build an app for mobile devices

## SECTION 8

# Final Project

It is time to go wild. In this section, you will have an opportunity to work with your colleagues and instructor on an extended project. We will collaboratively design and develop an XR application from scratch. It pulls together the streams of study, knowledge, and practical skills gained in the previous sections into a single, custom, and long-form project.

## LESSON 17 - 20

The following learning outcomes will be covered across the remaining sessions.

- Design for Scalability
- Analyze the technical feasibility of XR features
- Work collaboratively with a team
- Implement Events and Delegates
- Implement Scriptable Objects
- Create Visual Effects with Particle Systems
- Create Visual Effects with the Shader Graph
- Add Post Process Effects to a Scene
- Save data with PlayerPrefs.
- Use JSON files along with PlayerPrefs to save data
- Create code that allows for transitions between scenes
- Diagnose and fix performance problems
- Find performance bottlenecks
- Understand render pipelines



# **Northern Alberta Institute of Technology**

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