Virtual Reality Foundations Nanodegree Syllabus (nd105)

Join the Creative Revolution

Before You Start

Thank you for your interest in the Virtual Reality Foundations Nanodegree program! In order to succeed in this program, we recommend having some advanced computer skills, such as with a graphics editor or similar tools. Be prepared to write code, think like a designer, and work in teams.

In this program, you'll gain the skills needed to develop world-class Virtual Reality content. You'll master the core principles of VR development and design, learn to turn your creative ideas into high-performance VR applications, and pursue an advanced concentration as you transform from VR generalist to in-demand specialist. After you complete this program, you'll have a solid foundation of VR Development and can continue pursuing a career in VR through our career-ready Nanodegree program options.

Length of Program: 3 Months

Educational Objectives:
This VR Foundations Nanodegree program teaches the foundational skills and knowledge for VR Development. It is ideal for beginners who want to learn new skills, make informed choices about career goals, and set themselves up for success in career-track VR Nanodegree programs.

Prerequisites:
Intermediate computer skills, meaning you are comfortable with file management, installing software, working with zip archives, etc. Note: No programming experience is required, but if you have never written code before, be prepared to put in some extra hours to get up to speed.

Hardware Requirements:
- Computer running macOS 10.9.4 or higher.
- VR supported iPhone (iPhone 5 or later) or Android phone (comparable to Nexus 5, Galaxy S5, or later).

<div align="center">OR</div>

- Computer running Windows 7 SP1+, 8, 10 (only 64-bit versions are supported).
- VR supported Android phone (comparable to Nexus 5, Galaxy S5, or later).
  Note: iPhone is not a compatible option if you don't have access to a Mac.

UDACITY

Getting Started: What's the Code?

This project lets you experience multiple 3D environments from the Udacity VR program. You'll download the Udacity VR app and run it inside of your Cardboard headset. When you put on the headset, you'll walk around an apartment and island from the VR Nanodegree and see demonstrations of various VR techniques you'll soon learn. By trying this app, you will:

- ➔ See a demonstration of the VR techniques you'll learn in the VR Nanodegree program.
- ➔ Experience completed future projects you will learn how to build from scratch.
- ➔ Hunt for a secret code hidden in the VR world.

Project 1: Udacity Carnival

Customize and build a VR carnival game! When you begin, you'll have three carnival games that are out of order. It's your job to fix them. Using Unity, you'll fix each game by correctly wiring up the event system. After that, you'll customize each game with your own images and text. When you finish, you'll play the three games and send us your score. You'll win points, have fun, and learn a lot about event-based programming and art customization inside of Unity.

Supporting Module Content: Introduction to Virtual Reality

Lesson Title	Learning Outcomes
WHAT IS VR?	➔ Differentiate the components that make up Virtual Reality hardware and software such as specialized optics and trackers ➔ Differentiate types of Virtual Reality experiences you find on mobile and desktop devices ➔ Understand the tracking and optical technology behind a VR headset
PLATFORMS AND PARADIGMS	➔ Differentiate between VR platforms based on their sensor and performance capabilities ➔ Analyze the technical differences between various VR headsets like optical properties, tracking capabilities, ergonomics, and price-point ➔ Understand VR development paradigms for each headset
HELLO WORLD	➔ Download and Install all software for VR development ➔ Create your first VR application ➔ Modify an existing VR Unity project

Project 2: Build an Apartment

Become a VR architect and design an apartment! Start off by creating some walls. Next, add some couches, chairs, tables, and rugs. Don't forget to add a kitchen! Once you've finished decorating, be sure to add some nice mood lighting. Then, deploy it to your Cardboard headset.

Supporting Module Content: VR Scenes and Objects

Lesson Title	Learning Outcomes
GAME OBJECTS	➜ Create your first virtual game objects and add them to your scene ➜ Edit an object's transform property ➜ Navigate the Unity Interface
MATERIALS	➜ Creating materials ➜ Modifying properties of a material ➜ Using a texture on a material ➜ Creating a custom material with shaders
ANIMATIONS	➜ Using Unity's Mecanim system to animate objects ➜ Creating keyframes and using interpolation between keyframes ➜ Transitioning between Animations
CAMERAS	➜ Using the Camera component ➜ Creating a VR Camera in Unity ➜ Implementing Head Tracking
LIGHTS	➜ Create a performant well-lit Unity scene ➜ Differentiate between various types of lighting ➜ Using Global Illumination (GI)

Project 3: A Maze

Place the walls, add lights and materials, and then code a fully functional VR maze game using Unity and the Google VR SDK, where the user explores a maze environment to demonstrate working knowledge of 2D and 3D UI, waypoint based navigation, procedural animation, interactive objects, spatial audio, particle effects, and persistent storage of session data. Players will navigate the maze, collect coins along the way, then find a key that opens a gate to secret treasure.

Supporting Module Content: VR Software Development

Lesson Title	Learning Outcomes
CREATING SCRIPTS	➜ Link 3D models with C# code. ➜ Use code to move cubes ➜ Create your C# methods

CONTROLLING OBJECTS USING CODE	➔ Use the Unity documentation ➔ Creating references ➔ Create 100s of objects in a loop
VR INTERACTION	➔ Using multiple scenes and switching between them ➔ Create UI interfaces for VR ➔ Register for your code to activate on a condition
PROGRAMMING ANIMATIONS	➔ Use code to trigger animations ➔ Trigger animation parameters ➔ Start and Stop Animations
PHYSICS & AUDIO	➔ Code raycasts ➔ Detect collisions between objects ➔ Enable gravity on objects ➔ Play an audio clip
ADVANCED VR SCRIPTING	➔ Read existing code ➔ Modify existing complex scripts