

Virtual Reality High-Immersion Nanodegree Syllabus (nd107)



Join the Creative Revolution

Before You Start

Thank you for your interest in the Virtual Reality 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.

You'll learn the fundamentals of VR design including ergonomics, user testing, and interface design, as you establish a solid foundation to approach any VR design task. You'll hear exclusive perspective from industry professionals about the future of VR, and start preparing for your concentration.

Then you will focus on High-Immersion Development and finish off the program with a Capstone project where all of your new skills will come together in a portfolio-worthy project. By the end, you'll be ready to pursue a new career as a VR Developer!

Length of Program: 4 Months

Educational Objectives: This VR High-Immersion Nanodegree program teaches the skills and knowledge for VR Development specifically for High-Immersion. It is ideal for developers who want to learn new skills, make informed choices about career goals, and set themselves up for success with a career in VR Development.

Prerequisites: Intermediate computer skills, meaning you are comfortable with file management, installing software, working with zip archives, etc. Working knowledge of Unity. Beginning to intermediate experience with object-oriented programming. One month subscription to Adobe Premiere Pro.

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).
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- 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.
 - VR-ready PC (Intel i5 or greater, high-end graphics card).
 - HTC Vive or Oculus Rift.

Project 1: Puzzler

You will apply design techniques to iterate, document, and write a public write-up for a well-designed and user-tested mobile VR application that asks users to solve a familiar Simon-says-like puzzle in a new way. This write up will be graded as your course project.

Supporting Module Content: VR Design

Lesson Title	Learning Outcomes
INTRO TO VR DESIGN	<ul style="list-style-type: none">→ Understand basic VR design principles such as iteration, user testing, and documentation→ Analyze the Udacity VR app and deconstruct its design methodology
DESIGN FOUNDATIONS, ERGONOMICS, AND THE PUZZLER PROJECT	<ul style="list-style-type: none">→ Create a VR User Persona→ Design an ergonomic VR experience→ Create comfortable VR Text
SET THE SCENE, AND YOUR FIRST USER TEST!	<ul style="list-style-type: none">→ Create a VR Testing Scene→ Create your first User Test→ Document your first VR experience
GRAPHICAL USER INTERFACES	<ul style="list-style-type: none">→ Rapidly prototype VR interfaces→ Practice the Design loop
LET'S GET MOVING!	<ul style="list-style-type: none">→ Understand Simulator Sickness→ Experiment with various VR locomotion schemes→ Implement a teleportation locomotion
AUDIO GOODNESS, GAME MECHANICS, AND FEEDBACK!	<ul style="list-style-type: none">→ Understand the importance of audio in VR→ Implement 3D audio→ Use Google VR Spatial Audio
PRESENTING THE WORK	<ul style="list-style-type: none">→ Document your thought process→ Share your design process with others

Supporting Module Content: VR Platforms and Applications

Lesson Title	Learning Outcomes
PLATFORMS AND FOCUS PATHS	<ul style="list-style-type: none">→ Explore pros and cons of the major VR headsets on the market including Cardboard, Rift, Vive, Gear VR, PSVR, and more→ Decide what headset is the most exciting option, personally, to develop for
THE HORIZON	<ul style="list-style-type: none">→ Discover future technology that will impact VR development

such SLAM and eye tracking by examining VR prototypes and studies

MAJOR INDUSTRIES

- Understand the major professional industries that VR is impacting such as healthcare, architecture, gaming, and entertainment by reviewing projects in these spaces
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Project 2: Rube Goldberg Challenge

This project is a chance for you to create your first fully-functional high-immersion VR game. You'll create a Rube Goldberg game that challenges players to create contraptions that solve physics puzzles. First you'll import SteamVR and set up your scene environment. Then you'll add locomotion, grabbing physics, and a menu system. With the core components built, you'll create Oculus versions of your code.

Supporting Module Content: High Immersion

Lesson Title	Learning Outcomes
DESKTOP VR BENEFITS AND CONSTRAINTS	<ul style="list-style-type: none">→ Understand the benefits and constraints of the Vive and Oculus Rift→ Differentiate "modes" of high immersion development→ Understand design techniques of existing VR experiences
HIGH-IMMERSION ENGINEERING	<ul style="list-style-type: none">→ Import SteamVR and use it for input handling→ Create several locomotion mechanics→ Create hand interaction via grabbing and throwing of objects→ Create a swipeable object spawning menu
CROSS-PLATFORM DEVELOPMENT	<ul style="list-style-type: none">→ Use the Oculus SDK→ Translate our SteamVR functionality to use the Oculus SDK→ Manage two separate SDKs in one project for a cross-platform VR experience.

Project 3: Performance Bounceback

Performance optimization is one of the most important skill sets for a VR developer, since apps running below the target framerate are essentially unplayable, causing nausea and discomfort. This project simulates a real-world scenario in which a VR game has been hastily built with a focus on functionality rather than performance. You've been hired to take the game and make it a performant app ready for release!

Supporting Module Content: Performance and Publishing

Lesson Title	Learning Outcomes
DESKTOP VR OPTIMIZATION	<ul style="list-style-type: none">→ Understand Unity's most common performance bottlenecks→ Identify and fix them with Unity's performance tools
ADVANCED LIGHTING	<ul style="list-style-type: none">→ Use Unity's lighting system to maximize performance

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- Understand the pros and cons of Forward vs Deferred Rendering
 - Balance real-time and baked lighting for optimal performance,
 - Use optimal shadow settings
 - Use lightprobes

**PUBLISHING FOR
DESKTOP VR**

- Understand how to host your app on Steam, Viveport, and the Oculus Store
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Project 4: VR Nanodegree Capstone

For your final project, you will work to complete a series of VR challenges, winning points as you progress. You will create a VR project of your choosing, using any hardware. But, it must meet certain criteria in order to “win.” You can choose from a wide range of achievements like “app store submission,” “use of speech recognition,” or “mixed reality trailer.” Each achievement then wins you a different number of points. To successfully complete the project, you need to reach the required points level.