Virtual Reality Mobile 360 Nanodegree Syllabus (nd106)

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 Mobile 360 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 Mobile 360 Nanodegree program teaches the skills and knowledge for VR Development specifically for Mobile 360. 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.

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).

OR

- 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.
- One month subscription to Adobe Premiere Pro.

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	➔ 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	➔ Create a VR User Persona ➔ Design an ergonomic VR experience ➔ Create comfortable VR Text
SET THE SCENE, AND YOUR FIRST USER TEST!	➔ Create a VR Testing Scene ➔ Create your first User Test ➔ Document your first VR experience
GRAPHICAL USER INTERFACES	➔ Rapidly prototype VR interfaces ➔ Practice the Design loop
LET'S GET MOVING!	➔ Understand Simulator Sickness ➔ Experiment with various VR locomotion schemes ➔ Implement a teleportation locomotion
AUDIO GOODNESS, GAME MECHANICS, AND FEEDBACK!	➔ Understand the importance of audio in VR ➔ Implement 3D audio ➔ Use Google VR Spatial Audio
PRESENTING THE WORK	➔ 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	➔ 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	➔ 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

Project 2: Tic-Tac-Toe

In this project, you'll play detective and put your optimization skills to use by speeding up a poorly optimized VR game. The game is Tic-Tac-Toe, played against a friendly AI Robot. While fun and attractive, the only problem is that the experience is completely unoptimized for mobile VR. Your task is to use what you've learned to optimize this project to run at 60 frames per second on your phone.

Supporting Module Content: Mobile Performance

Lesson Title	Learning Outcomes
PERFORMANCE METRICS	➔ Experience a poorly performing VR application and understand how to diagnose different types of problems like low framerate due to GPU performance vs CPU performance ➔ Reading and interpreting the FPS display ➔ Measure power usage on mobile devices ➔ Mitigate heat management issues
GRAPHICS PIPELINE	➔ Track which parts of a 3D scene tax the CPU, GPU, and battery ➔ Use the Frame Debugger to analyze how a scene is rasterized ➔ Use the Stats window to get a high-level overview of the local scene performance ➔ Implement SetPass reduction strategies
THE PROFILER	➔ Measure the performance of a VR application running on a mobile device using Remote Profiling ➔ Identify poorly performing scripts using the Profiler and Debugger
SCRIPT PERFORMANCE	➔ Analyze code for inefficient algorithms, object lookups, and unnecessary overhead
OPTIMIZATIONS	➔ Implement an object pooling strategy ➔ Optimize poorly performing shaders ➔ Optimize game physics ➔ Optimize inefficient game art

Project 3: The Protagonist's Journey

In this project, you'll do everything you need to prepare for a 360 shoot. You'll write the script, produce the storyboard, and then finally plan the logistics surrounding the shoot. By the end, you'll be prepared to make a great 360 film.

Supporting Module Content: 360 Media Pre-Production

Lesson Title	Learning Outcomes
INTRODUCTION TO IMMERSIVE MEDIA	➔ Understand the principles of immersive 360 media such as spherical projection by critically reviewing professional 360 content ➔ Understand the basic workflow of creating 360 Video ➔ Applying Metadata to 360 video and publishing that content
DEVELOPING A CRITICAL EYE	➔ Analyze a variety of existing 360 video content ➔ Analyze footage for the various techniques, tips, and tricks other film makers may use to direct attention in 360
SCRIPTING AND PLANNING	➔ Create a script for 360 content ➔ Plan a 360 shoot ➔ Edit scripts to match equipment and budget
360 STORYBOARDING	➔ Storyboard using a variety of methods ➔ Differences between storyboarding for 360 and regular video
360 CAMERAS	➔ Exploration of existing 360 cameras ➔ Differentiate between monoscopic and stereoscopic capture ➔ Place cameras appropriately for 360 imaging
MICROPHONES AND LIGHTING	➔ Explore different equipment and techniques used for audio capture ➔ Explore lighting techniques for 360 video

Project 4: The Storyteller's Revenge

In this project, you'll stitch together your own footage (or footage provided). Then, you'll correct the color and edit the raw footage into a story. Finally, you'll build a custom 360 video player in Unity and add controls, particles, titles, credits, and at least one interaction (like a button and trigger pull, or a gaze-based interaction). The interaction should trigger a different video, branch the story, or allow for replayability.

Supporting Module Content: 360 Media Production

Lesson Title	Learning Outcomes
STITCHING	➔ Stitch 360 video using Autopano Video Pro ➔ Blend, weight, synchronize, and stabilize footage
EDITING BASICS	➔ Edit footage in Adobe Premiere ➔ Create transitions in 360 video
ADVANCED EDITING	➔ Color correct 360 footage ➔ Add title screens to your video ➔ Add points of interest using GoPro's plugin

ADVANCED STITCHING	➔ Use Autopano Giga to edit and refine stitching using control points and masks ➔ Gain a deeper understanding of how blending works
SPATIAL AUDIO	➔ Cut spatialized audio ➔ Place sound in 3D space using Google audio spatializer
INTERACTIVITY WITH UNITY	➔ Create an interactive 360 experience using Unity's video player ➔ Create player controls and branching storylines using a custom 360 video player

Project 5: 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.