

## Villanova University Unreal Engine Workshop

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**Please monitor your Villanova email account on a regular basis to ensure that you receive class messages from the instructor.**

### Workshop Description

The rise of Virtual Reality (VR) is apparent in many different sectors. NASA has been using computer simulations to train astronauts. Manufacturing companies are developing prototypes without wasting materials or endangering lives. Even healthcare has been using VR to help rehabilitate those who have been through trauma, whether it be physical, mental, or emotional. Pharmaceutical companies are virtually building molecules to create new drugs.

During this workshop we are going to explore the possibilities of using Unreal Engine 4. While doing so, we will be examining our project through the lens of Imitationalism, an aesthetic art theory, to deliver curriculum in a whole new way; as an experience.

Workshop Materials: Unreal Engine 4.19. There will also be short tutorial videos that I will assign. These videos are open source and direct from the developers of Unreal.

### Learning Objectives

- To familiarize yourself with the Unreal Editor's interface
- To gain a foundation for creating a basic virtual environment
- To acquire a strong background in preparation to learn more complex methods of creating your own experience

### General Information

"Experience is the teacher of all things." - Julius Caesar in *Commentarii de Bello Civili* (Commentaries on the Civil War).

Credence is still given to this proverb. An experience can be defined as the observation of an event as it's transpiring. VR offers something called immersion; in this regard, immersion is achieved through most of our senses being used at once. In turn, the brain is fooled and takes care of the rest, making you feel as though the encounter is real.

Consider the possibilities. After reading Macbeth, transport yourself to the edge of battle where three prophetic witches await. Use the data processed from a microscope to observe the contents of a cell with a few simple hand gestures. Go to the ruins of the Parthenon in Greece without the expense or hassle of airport security. Let's take this one step further. Travel back in time to its majestic prime, based on archaeologists' best guess. With VR, be whomever you want, be wherever you want, and be whenever you want.

### Example Applications

The link below take you to the CLAS VR website where many examples can be found:

- [https://www1.villanova.edu/villanova/artsci/faculty\\_staff/clasit/clasvr\\_secure/applications.htm](https://www1.villanova.edu/villanova/artsci/faculty_staff/clasit/clasvr_secure/applications.htm)  
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### Method of Instruction

This workshop is project driven. Every week we will progress further with our VR environments. The beginning of each class will be spent on a brief review of the previous class. After that we will move on to the next phase of our project. There will be demonstrations and it will be hands-on. Toward the end of each class there will be time for questions.

### Schedule

- Before week 1 complete the following:
  - If you don't have one already, create an Epic Account by going to <https://www.unrealengine.com/en-US/education> and clicking on "Sign In". It is located in the upper right-hand corner. Click "Sign Up" on the next page to begin the process.
  - Watch the following videos:
    - Intro to the UE4 Editor  
- [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_NO\\_O1gasd4IcOe9Cx9wHoBB7rxFI/w4XIBKeE46E](https://docs.unrealengine.com/en-us/Videos//PLZlv_NO_O1gasd4IcOe9Cx9wHoBB7rxFI/w4XIBKeE46E)
    - Intro to the Content Browser (some information is repeated)  
- [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_NO\\_O1gasd4IcOe9Cx9wHoBB7rxFI/tG2KML-CDRo](https://docs.unrealengine.com/en-us/Videos//PLZlv_NO_O1gasd4IcOe9Cx9wHoBB7rxFI/tG2KML-CDRo)
- WEEK 1 (Date): The Unreal Editor Interface
  - Basic tutorial of the interface
  - Will start to add assets to our landscape which will reinforce familiarity of the interface
    - Start adding 4 walls, ceiling, floor
  - Homework - watch before next week:
    - Placing Objects in your Level  
- [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_NO\\_O1gasd4IcOe9Cx9wHoBB7rxFI/01BL2bWeJSA](https://docs.unrealengine.com/en-us/Videos//PLZlv_NO_O1gasd4IcOe9Cx9wHoBB7rxFI/01BL2bWeJSA)
    - Moving Objects  
- [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_NO\\_O1gasd4IcOe9Cx9wHoBB7rxFI/wHJCv-Ph6zU](https://docs.unrealengine.com/en-us/Videos//PLZlv_NO_O1gasd4IcOe9Cx9wHoBB7rxFI/wHJCv-Ph6zU)

- Rotating Objects
    - [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_N0\\_O1gasd4IcOe9Cx9wHoBB7rxFI/ralshA7aWag](https://docs.unrealengine.com/en-us/Videos//PLZlv_N0_O1gasd4IcOe9Cx9wHoBB7rxFI/ralshA7aWag)
  - Scaling Objects
    - [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_N0\\_O1gasd4IcOe9Cx9wHoBB7rxFI/rqJoX8orsUM](https://docs.unrealengine.com/en-us/Videos//PLZlv_N0_O1gasd4IcOe9Cx9wHoBB7rxFI/rqJoX8orsUM)
- WEEK 2 (Date): Assets and Actors
  - A deeper dive into adding objects to our world, a.k.a. wire meshes
    - Add a lamp, chair, door, window
  - Maneuvering through our content library
    - Take note of the default folder structure
  - Includes manipulation of assets (rotation, placement, scaling, etc...)
  - Homework - watch before next week:
    - Adding Props and Lighting (Start video at 2:50 and watch until 5:10)
      - [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_N0\\_O1gak1\\_FoAJVrEGiLlploeF3F/mkchwELEXqk](https://docs.unrealengine.com/en-us/Videos//PLZlv_N0_O1gak1_FoAJVrEGiLlploeF3F/mkchwELEXqk)
    - Lighting Basics
      - <https://vimeo.com/album/5228161/video/274795099>
- WEEK 3 (Date): Lighting and Intro to Materials
  - Placement of lighting, color, and how that can affect your environment
  - Introduce the materials interface
    - How to sample textures before application
  - Homework - watch before next week:
    - Creating a Basic Material
      - [https://docs.unrealengine.com/en-us/Videos//PLZlv\\_N0\\_O1gbQjgY0nDwZNYe\\_N8IcYWS-/Yb4uu2NECOE](https://docs.unrealengine.com/en-us/Videos//PLZlv_N0_O1gbQjgY0nDwZNYe_N8IcYWS-/Yb4uu2NECOE)
- WEEK 4 (Date): Continuation of Materials
  - How the apply texture to your actors and assets
  - How lighting can affect your textures
  - Create terrain outside the room
  - Homework watch before next week:
    - Animation Blueprints
      - <https://vimeo.com/album/5228161/video/274791908>
- WEEK 5 (Date): Intro to Animation
  - Experiment with a mannequin in the animation interface
- WEEK 6 (Date): Animation
  - Add a mannequin to our environment and give it something to do
  - Something simple such as walk, run, wave, etc.
  - Homework – watch before next week:
    - Start video at 47:28 and watch until the end: Amplifying Your Game's Audio with FMOD
      - [https://www.youtube.com/watch?v=1QdDwQONq\\_g](https://www.youtube.com/watch?v=1QdDwQONq_g)
- WEEK 7 (Date): Sound
  - Experimenting with adding sound affects
    - Placement of sound source for optimal realism
- WEEK 8 (Date): Final day

- Where to find additional assets
  - Where to place them in your content folders
- How to create your own assets
  - Blender, sound effects, etc...
- Tweaking of any kind
  - Finishing touches
  - Questions?

## Unreal Terms and Definitions

Actors – Any object in your virtual space, such as a chair, mannequin, or wall.

- <https://docs.unrealengine.com/en-us/Programming/UnrealArchitecture/Actors>

Assets – Any things that is in your virtual world. This encompasses actors, sound effects, of materials.

- <https://docs.unrealengine.com/en-us/Engine/Basics/AssetsAndPackages>

Blueprint – Unreal's user-friendly way to code custom programming without having to actually know C++.

- <https://docs.unrealengine.com/en-us/Resources/Showcases/BlueprintExamples>

Geometry – More basic structures that can be added to your virtual space, used most commonly as place holders.

- <https://docs.unrealengine.com/en-us/Engine/Actors/Brushes>

Lighting – The arrangement of our light sources, which can affect the feel and tone of our spaces.

- <https://docs.unrealengine.com/en-us/Resources/ContentExamples/Lighting>

Materials – In a word, textures. These make our actors look like that are made of some real life such as wood, chrome, or brick.

- <https://docs.unrealengine.com/en-us/Engine/Rendering/Materials>

## Unreal Tutorials (open source)

Continue your education in Unreal:

- <https://www.unrealengine.com/en-US/video-tutorials>

## Free Assets

Further customize your virtual world with free high quality assets.

- <https://www.unrealengine.com/marketplace/free>
- <https://stevelois.com/ue4/ue4-resources/>
- <https://www.turbosquid.com/Search/3D-Models/free>

## Grant Info

Interested in becoming an entrepreneur with the knowledge you gained from this workshop? Below are examples of NSF grants for you to do so:

- EA2. Global, Distance, and Higher Education  
- <https://seedfund.nsf.gov/topics/educational/>
- IT11. Human-Computer Interaction; Virtual Reality; Augmented Reality  
- <https://seedfund.nsf.gov/topics/information-technologies/>

## Villanova VR Competition

Want to put your skills to the test? Enter the Villanova VR Competition:

- <https://www1.villanova.edu/villanova/artsci/ceet/news/villanova-university-virtual-reality-competition.html>

## Unity and Unreal

The guide below will show the parallels between Unity and Unreal. This can be used to help you switch back and forth between both engines:

- <https://docs.unrealengine.com/en-US/GettingStarted/FromUnity>