



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AUGMENTED REALITY AND VIRTUAL REALITY LABORATORY								
VI Semester: CSE (AI & ML)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
ACAD21	Core	L	T	P	C	CIA	SEE	Total
		0	0	2	1	40	60	100
Contact Classes: NIL	Tutorial Classes: NIL	Practical Classes: 45			Total Classes: 45			
Prerequisite:								

I. COURSE OVERVIEW:

Students no longer need to be present in the real-life classroom in order to interact with the world around them in a more engaging way through the use of VR and AR. Students will need to comprehend a wide range of abilities, such as 3D programming, Unity & Unreal Engine, and C#, to build AR and VR experiences. Modern classrooms, excellent connectivity, and modern technology can foster the growth of AR and VR education technologies in a virtual reality city inside a smart city.

II. COURSES OBJECTIVES:

The students will try to learn

- The installation and the fundamental concepts of AR and VR
- The significance of the tools, technologies and working principles of AR/VR.
- Models using modelling techniques and develop AR/VR applications in different domains

III. COURSE OUTCOMES:

At the end of the course students should be able to:

- CO1 **Explain** installing the UNITY software, basics, and also developing a scene to create project and work with Unity Interface.
- CO2 **Develop** virtual reality games using sophisticated Unity capabilities like game objects navigation and ray casting using tools and technologies in AR/VR.
- CO3 **Extend** the method for adding support for the "Scene" in UNITY by using VR controllers and also C# coding to apply materials, box collider to the objects and C#.
- CO4 **Describe** virtual environment for use case using VR applications and Unity Script to do animation, interaction with game objects and working with unity script.
- CO5 **Create** new project with Unity and experiment with various techniques that are used in VR applications and creating unity scripts
- CO6 **Construct** a virtual reality space shooter game in Unreal Engine with real-time tactics and an emphasis on teamwork and collaboration among participants to describe AR techniques.

IV. COURSE CONTENT:

Week-1: Installation of Unity and Visual Studio

Need to create project and work with Unity Interface (create Game Objects Cube and Capsule)

Week 2: Working with Objects

Take a only 5 Game Objects should be Cubes and all Game objects should be rotate at a time and Plane is the surface

Develop a scene in Unity that includes:

- A cube, plane, and sphere, apply transformations on the 3 game objects.
- Add a video and audio source

Week-3: Working with Game Objects - 1

- i. Develop a scene in Unity that includes a cube, plane, and sphere.
- ii. Create a new material and texture separately for three Game objects.
- iii. Change the colour, material, and texture of each Game object separately in the scene.

Week-4: Working with Game Objects - 2

- a) Write a C# program in visual studio to change the color and material/texture of the game objects dynamically on button click.
- b) Take a only 5 Game Objects should be Cubes and all Game objects should be rotate at a time and Plane is the surface
- c) Move the Player left and Right and also camera Movement along with the Player with C# Script

Week-5: VR controller

- i. Develop a scene in Unity that includes a sphere and plane. Apply Rigid body component, material, and Box collider to the game Objects.
- ii. Write a C# program to grab and throw the sphere using VR controller.

Week-6: VR User interface

- i. Develop a simple UI (User interface) menu with images, canvas, sprites, and button.
- ii. Write a C# program to interact with UI menu through VR trigger button such that on each successful trigger interaction displays a score on scene.

Week-7: VR Application

Create a virtual environment for any use case. The application must include at least 4 scenes which can be changed dynamically, a good UI, animation and interaction with game objects. (e.g. VR application to visit a zoo)

Week-8: Creating Unity scripts

Working with unity script

- i. Creating and assigning scripts
- ii. Adding Code

Week-9: Create a new Project name Kiddy Ball Runner

- a) Player Jump
- b) Creating Prefabs
- c) Generating Infinite Platforms

Week-10:

- a) Coins collection
- b) Score Display
- c) Adding Background Colour
- d) If player touches enemy game over

Week-11: Post-Processing & Rendering-I

kode80SSR - screen-space reflections.
KinoObscurance - screen-space ambient obscurance.
PixelRenderUnity3D - pixelized rendering.
PixelCamera2D - pixel-perfect rendering.
KinoMotion - motion blur using motion vectors.
KinoContour - edge detection.
KinoGlitch - glitch effect.

Week-12: Post-Processing & Rendering-II

KinoBloom - bloom.
KinoBokeh - bokeh effect.
KinoVision - frame information visualizer.
Unity5Effects - post-processing collection.

LightShafts - light shafts.
SonarFx - wave patterns.
Cinematic Image Effects - cinematic image effects.

V. TEXT BOOKS:

1. Todd Brinkman, "Virtual Reality for Main Street A Beginner's Guide to Unleashing Human Connections". J. Davidso, "Oculus Rift (For Beginners)".
2. Dr. Edward Lavieri, "Getting Started with Unity 2018", Third Edition: A Beginner's Guide to 2D and 3D game development with Unity".

VI. REFERENCE BOOKS:

1. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
2. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
3. Grigore C. Burdea, Philippe Coiffet, "Virtual Reality Technology", Wiley Inter Science, 2nd Edition, 2006.
4. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.

VII. ELECTRONICS RESOURCES:

1. <http://www.vrac.iastate.edu/>

VIII. MATERIALS ONLINE

1. Course Content
2. Lab Manual