	Augmented and Virtual Reality Programming	L	T	P	C
		30	0	30	3

OBJECTIVES

The Student should be made to:

- Develop engaging Augmented Reality and Virtual Reality applications.
- Learn core skills needed for developing AR and VR applications such as basics of 3D graphics, design considerations and programming toolkits.
- Explore industry standard development platforms such as Unity3D, Vuforia, ARCore and ARKit
- Publish Augmented Reality (AR) applications to both Android and IOS
- Develop Virtual Reality applications and publish to a variety of headsets.
- Learn the fundamentals of C# programming to create AR/VR experiences in Unity3D

UNIT I	Introduction to 3D graphics and AR VR fundamentals	10

Introduction to 3D graphics concepts – modelling, file formats – texturing – lighting and rendering – animation – AR / VR and MR (Mixed Reality) concepts – mobile phones and headset applications – basic introduction to ARCore and ARKit

UNIT II	Exploring the Unity 3D programming toolkit	10

Introduction to Unity 3D Interface – Using Unity 3D to create AR and VR applications – Importing and creating assets – User Interfaces for AR and VR – Combining assets into complex models – Adding physics to the interactions - Creating an AR Application and publishing to a mobile device.

UNIT III	C# programming and scripting for AR and VR	15

C# programming introduction – data types and classes – programming logic – using C# to write scripts for Unity 3D – Using C# to animate and add advanced interactions to AR and VR models

UNIT IV	Virtual Reality Application essentials	15

Virtual Reality fundamentals – VR design considerations – Using Unity 3D and C# programming to create VR applications – Oculus Quest VR headset fundamentals – User interface considerations - Creating a VR application and publishing to the Oculus VR headsets

UNIT V	Industry applications of AR and VR	10

Industry domains where AR and VR are applied – healthcare, manufacturing, field service, retail and branding – Design considerations while creating domain specific applications – Example industry applications – Writing an industry application from a domain of your choice

TOTAL : 60 PERIODS (30 hours of lecture and 30 hours of practical)

COURSE OUTCOMES:

CO1	Students will be able to understand the design considerations of AR and VR applications	**L2**
CO2	Students will be able to write AR and VR applications using the industry standard tool Unity 3D	**L3**
CO3	Students will be able to use C# along with Unity 3D to add advanced interaction and physics to their simulations	**L3**
CO4	Students will be able to publish AR and VR applications to mobile phones (IOS and Android) and to headsets (Oculus Quest)	**L3**
CO5	Students will be able to understand where AR and VR is used in industry and how to design applications for the same	**L2**

LIST OF EXPERIMENTS:

1. Understand the Unity interface and Manipulate objects in the Unity 3D Editor and build 3D assets (Cube, cylinder, sphere and characters).
2. Create a Unity project to incorporate basic physics and simple animation into the 3D models. Add assets from the standard asset library.
3. Create a terrain in Unity 3D and navigate through it.
4. Write a basic C# standalone program for a banking and interest computation application
5. Write a C# application for storing and retrieving complex multimedia data
6. Develop a 2D User Interface and use it in a 2D gaming experience.
7. Create an AR Application machine placement application and use surface tracking and publish to mobile device.
8. Create an AR face tracking application and publish to mobile device.
9. Write a C# script and attach it to a 3D asset in Unity to animate it.
10. Develop a simple Unity 3D environment with user interactions, animations and navigation.
11. Create a VR application for a simple game in Unity 3D and publish it to the Oculus headset.
12. Develop a VR training application using XR Interaction toolkit.

TEXT BOOKS:

1. Unity Virtual Reality Projects – Jonathan Linowes
2. Unity 3D UI Essentials – Simon Jackson
3. UX for XR: User experience design and strategies for Immersive Technologies (Design Thinking) – Cornell Hillmann
4. Learn C# by developing games in Unity 3D – Terry Norton
5. Complete Virtual Reality and Augmented Reality Development with Unity – Jesse Glover, Jonathan Linowes

* L-Lecture, T-Tutorial, P-Practical, C- Credit