INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)
Dundigal - 500 043, Hyderabad, Telangana

COURSE CONTENT

AUGMENTED REALITY AND VIRTUAL REALITY								
VII Semester: CSE (AI&ML)								
Course Code	**Category**	**Hours / Week**			**Credits**	**Maximum Marks**		
		L	**T**	**P**	**C**	**CIA**	**SEE**	**Total**
ACAD26	**Elective**	3	0	0	3	40	60	100
Contact Classes: 48	**Tutorial Classes: Nil**	**Practical Classes: Nil**				**Total Classes: 48**		
Prerequisites: No Prerequisites								

I. COURSE OVERVIEW:
The aim of this course is to promote understanding of fundamental knowledge in physics needed for future technological advances. The concepts covered are in the fields of solid-state physics, modern physics, superconductors and nanoscience. This knowledge helps to develop the ability to apply the principles in many advanced technological sectors such as nanotechnology, optical fiber communication, quantum technology etc.

II. COURSE OBJECTIVES:
The students will try to learn:

I. A strong, fluid Augmented Reality and Virtual Reality applications with Unity.
II. Rapidly expanding subject of augmented reality and educate them on the many types of Augmented Reality gadgets.
III. Locate, research and develop software that emulates the core techniques employed in the development and application of virtual reality experiences

III. COURSE OUTCOMES:
At the end of the course, student should be able to:

CO1 Describe VR systems work and list the applications of VR. Students will understand the history, importance and applications of Augmented and Virtual Reality.
CO2 Summarize AR Devices & Components that enables VR systems to be built and working with Tracking & monitoring system and Tracking system, monitoring system.
CO3 Explain the system of human vision and its implication on perception and rendering to understand the integration of different sensors with AR/VR systems.
CO4 Make use of the concepts of motion and tracking VR systems in the usage of computer vision to develop AR systems.
CO5 Demonstrate the importance of interaction and audio in VR systems. Development, testing, applications and methods in aid of Virtual and Augmented Reality for Immersive visualization and allied areas.
CO6 Create computer vision concepts for AR and describe AR techniques. Acquiring knowledge of mixed reality.

IV. COURSE CONTENT:

MODULE – I: INTRODUCTION TO AUGMENTED REALITY (10)
History of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

MODULE – II: AR DEVICES AND COMPONENTS (09)
AR Devices & Components: AR Components – Scene Generator, tracking system, monitoring system, display, Game scene. AR Devices – Optical See- Through HMD, Virtual retinal systems, Monitor bases systems, Projection displays, Video see-through systems.

MODULE – III: INTRODUCTION TO VIRTUAL REALITY (10)
Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System.

Interface to the Virtual World-Input & output- Visual, Aural & Haptic Displays, Applications of Virtual Reality.

MODULE – IV: REPRESENTING THE VIRTUAL WORLD (10)
Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR, Case Study: GHOST (General Haptics Open Software Toolkit) software development toolkit.

MODULE – V: VISUAL PERCEPTION AND RENDERING (09)
Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information, Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates.

V. TEXTBOOKS:

1. "Virtual and Augmented Reality (Vr/Ar): Foundations and Methods of Extended Realities (Xr)", Doerner, R., Broll, W., Grimm, P., Jung, B. (Eds.)
2. "Virtual and Augmented Reality (VR/AR), Foundations and Methods of Extended Realities (XR)" Ralf Doerner, ,Wolfgang Broll, Paul Grimm, Bernhard Jung.

VI. REFERENCE BOOKS:

1. Augmented Reality Flash Mob. <www.sndrv.nl/ARflashmob>.
2. Augmented reality glasses are at least 20 years away. <www.augmentedplanet.com>. August 18, 2010.
3. Fuchs, P., &Moreau, G. (2006). Virtual Reality: Concepts and Technologies. Boca Raton, FL: CRC Press
4. Klie, L. (2016). Virtual reality to become a true reality: IAB report predicts increased use of 360-degree video amid virtual reality's growth as a marketing channel. CRM Magazine, (12). 14.
5. Craig, Alan B. (2013). Understanding Augmented Reality; Concepts and Applications. Waltham, MA, Morgan Kaufmann/Elsevier.

VII. WEB REFERENCES

1. https://www.synechron.com/sites/default/files/white-paper/Augmented-Reality-And-Virtual-Reality.pdf
2. https://files.isec.pt/DOCUMENTOS/SERVICOS/BIBLIO/INFORMA%C3%87%C3%95ES%20ADICIONAIS/Virtual-reality-2ed_Burdea.pdf

3. http://msl.cs.uiuc.edu/vr/
4. http://lavalle.pl/vr/book.html
5. http://cambum.net/course-2.htm

VIII. MATERIALS ONLINE

1. Course template
2. Tutorial question bank
3. Tech talk topics
4. Open-ended experiments
5. Definitions and terminology
6. Assignments
7. Model question paper – I
8. Model question paper – II
9. Lecture notes
10. PowerPoint presentation
11. E-Learning Readiness Videos (ELRV)