

**RAJIV GANDHI PROUDYOGIKI VISHWAVIDYALAYA,  
BHOPAL**

**New Scheme Based On AICTE Flexible Curricula**

**CSE-Artificial Intelligence and Machine Learning/ Artificial Intelligence and Machine Learning, VII-Semester**

**AL 703(B) Augmented and Virtual Reality**

**Course Objective:** The objective of this course is to provide students a general introduction of Virtual and Augmented Environments followed by an analysis of features, requirement and issues in real-life applications.

**Unit I:** Introduction to Virtual Reality- Virtual Reality and Virtual Environment: Introduction, Applications of Virtual Reality, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark 3D Computer Graphics: Introduction, The Virtual world space, positioning the virtual observer, the perspective projection, human vision, stereo perspective projection, 3D clipping, Colour theory, Simple 3D modeling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

**Unit II:** Geometric Modeling- Geometric Modeling: Introduction, From 2D to 3D, 3D space curves, 3D boundary representation Geometrical Transformations: Introduction, Frames of reference, Modeling transformations, Instances, Picking, Flying, Scaling the VE, Collision detection Generic VR system: Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems.

**Unit III:** Virtual Environment -Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in betweening, free from deformation, particle system. Physical Simulation: Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft.

**Unit IV:** VR Hardware and Software- Human factors: Introduction, the eye, the ear, the somatic senses. VR Hardware: Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems. VR Software: Introduction, Modeling virtual world, Physical simulation, VR toolkits, Introduction to VRML

**Unit V:** Augmented and Mixed Reality- Taxonomy, Technology and features of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, Augmented reality methods, visualization techniques for augmented reality, wireless displays in educational augmented reality applications, mobile projection interfaces, marker-less tracking for augmented reality, enhancing interactivity in AR environments, evaluating AR systems.

**References:**

1. John Vince, "Virtual Reality Systems ", Pearson Education Asia, 2007.
2. Anand R., "Augmented and Virtual Reality", Khanna Publishing House, Delhi.
3. Adams, "Visualizations of Virtual Reality", Tata McGraw Hill, 2000.
4. Grigore C. Burdea, Philippe Coiffet , "Virtual Reality Technology", Wiley Inter Science, 2 nd Edition, 2006.
5. William R. Sherman, Alan B. Craig, "Understanding Virtual Reality: Interface, Application and Design", Morgan Kaufmann, 2008.
6. Alan B Craig, William R Sherman and Jeffrey D Will, Developing Virtual Reality Applications: Foundations of Effective Design, Morgan Kaufmann, 2009
7. Paul Mealy,"Virtual & Augmented Reality for Dummies", publishers Wiley,June 2018