

Technology Centre for Gaming & AR-VR

Syllabus:

Introduction to Virtual Reality

(6 hours)

Introduction, Fundamental Concept and Components of Virtual Reality. Primary Features and Present Development on 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 modelling, Illumination models, Reflection models, Shading algorithms, Radiosity, Hidden Surface Removal, Realism-Stereographic image.

Interactive Techniques in Virtual Reality

(6 hours)

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.

Visual Computation in Virtual Reality:

(6 hours)

Animating the Virtual Environment: Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object inbetweening, 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.

Augmented and Mixed Reality

(6 hours)

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.

Multiple Models of Input and Output Interface in Virtual Reality: (6 hours)

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, Input -- Tracker, Sensor, Digital Glove, Movement Capture, Video-based Input, 3D Menus & 3DScanner etc. Output -- Visual /Auditory / Haptic Devices.

Application of VR in Digital Entertainment (6 hours)

VR Technology in Film & TV Production. VR Technology in Physical Exercises and Games. Demonstration of Digital Entertainment by VR.

List of Practical's (9 hours)

- Developing architecture of a house using Virtual Reality.
- Perform CRO based experiment using Virtual Reality.
- Undertaking qualitative analysis in Chemistry using Virtual Reality.
- Carry out assembly/disassembly of an engine using Virtual Reality.
- Explore human anatomy using Virtual Reality.
- Simulation of circulation of blood in heart.
- Simulation of Fight/Vehicle/Space Station.
- Building Electronic circuit using Virtual Reality, given basic electronic components.
- Developing concept of Virtual class room with multiplayer.

Text Books

- Burdea, G. C. and P. Coffet. Virtual Reality Technology, Second Edition. Wiley-IEEE Press, 2003/2006.
- Alan B. Craig, Understanding Augmented Reality, Concepts and Applications, Morgan Kaufmann, 2013.

- Alan Craig, William Sherman and Jeffrey Will, Developing Virtual Reality Applications, Foundations of Effective Design, Morgan Kaufmann, 2009.
- John Vince, “Virtual Reality Systems “, Pearson Education Asia, 2007.
- Anand R., “Augmented and Virtual Reality”, Khanna Publishing House, Delhi.
- Adams, “Visualizations of Virtual Reality”, Tata McGraw Hill, 2000.
- Grigore C. Burdea, Philippe Coiffet , “Virtual Reality Technology”, Wiley Inter Science, 2nd Edition, 2006.

- William R. Sherman, Alan B. Craig, “Understanding Virtual Reality: Interface, Application and Design”, Morgan Kaufmann, 2008.
- www.vresources.org
- www.vrac.iastate.edu
- www.w3.org/MarkUp/VRM

Resources From

- AICTE
- IIT Varanasi, India

Estd - 2001