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| <b>Augmented Reality &amp;<br/>Virtual Reality</b> | <b>L</b> | <b>T</b> | <b>P</b> | Programming, Problem<br>Solving, Engineering Graphics |
|  | <b>3</b> | <b>1</b> | <b>-</b> |   |

**Course Objective:**

1. Learn the fundamental Computer Vision, Computer Graphics and Human-Computer interaction techniques related to VR/AR
2. Review the Geometric Modeling Techniques in AR/VR
3. Discuss the Virtual Environment and Examine VR/AR Technologies
4. Use of various types of Hardware and Software in Virtual Reality systems
6. Simulate and Apply Virtual/Augmented Reality to varieties of Applications

| <b>S. NO</b> | <b>Course Outcomes (CO)</b>  |
|--------------|--|
| <b>CO1</b>   | Understand the fundamental Computer Vision, Computer Graphics and Human Computer Interaction Techniques related to VR/AR |
| <b>CO2</b>   | Learn Geometric Modeling Techniques and its Virtual Environment.   |
| <b>CO3</b>   | Analyze and Evaluate the VR/AR Technologies.   |
| <b>CO4</b>   | Apply various types of hardware and software in Virtual Reality systems and formulate AR/VR applications.                |

| S. NO  | Contents   | Contact Hours |
|--------|--|---------------|
| UNIT 1 | <b>Introduction to Virtual Reality (VR):</b> Virtual Reality and Virtual Environment, Computer graphics, Real time computer graphics, Flight Simulation, Virtual environment requirement, benefits of virtual reality, Historical development of VR, Scientific Landmark   | 8             |
| UNIT 2 | <b>Virtual Environment:</b> Input/Output Devices: Input (Tracker, Sensor, Digital Gloves, Movement Capture, Videobased Input, 3D Menus & 3D Scanner, etc.), Output (Visual/Auditory/Haptic Devices)<br><b>Generic VR system:</b> Introduction, Virtual environment, Computer environment, VR technology, Model of interaction, VR Systems, <b>Animating the Virtual Environment:</b> Introduction, The dynamics of numbers, Linear and Nonlinear interpolation, the animation of objects, linear and non-linear translation, shape & object in between, free from deformation, particle system<br><b>Physical Simulation:</b> Introduction, Objects falling in a gravitational field, Rotating wheels, Elastic collisions, projectiles, simple pendulum, springs, Flight dynamics of an aircraft | 12            |
| UNIT 3 | <b>Augmented Reality (AR):</b> Taxonomy, Technology and Features of Augmented Reality, AR Vs VR, Challenges with AR, AR systems and functionality, Augmented Reality Methods, Visualization Techniques for Augmented Reality, Enhancing interactivity in AR Environments, Evaluating AR systems  | 8             |
| UNIT 4 | <b>Development Tools and Frameworks Human factors:</b> Introduction, the eye, the ear, the somatic senses<br><b>Hardware:</b> Introduction, sensor hardware, Head-coupled displays, Acoustic hardware, Integrated VR systems<br><b>Software:</b> Introduction, Modelling virtual world, Physical simulation, VR toolkits, Introduction to VRML<br><b>AR / VR Applications:</b> Introduction, Engineering, Entertainment, Science, Training, Game Development   | 6             |
|        | <b>TOTAL</b>   | <b>42</b>     |

#### REFERENCES

| S.No. | Name of Books/Authors/Publishers   | Year of Publication / Reprint |
|-------|--|-------------------------------|
| 1     | Craig, A. B., "Understanding Augmented Reality, Concepts and Applications," Morgan Kaufmann, ISBN: 9780240824086                       | 2013                          |
| 2     | Craig, A. B., Sherman, W. R., Will, J. D., "Developing Virtual Reality Applications, Foundations of Effective Design," Morgan Kaufmann | 2009                          |
| 3     | John Vince, J., (2002), "Virtual Reality Systems, " Pearson, ISBN: 9788131708446   | 2002                          |
| 4     | Anand, R., "Augmented and Virtual Reality," Khanna Publishing House  | 2022                          |

|   |   |      |
|---|---|------|
| 5 | Kim, G. J., (2005), “Designing Virtual Systems: The Structured Approach”, ISBN: 9781852339586 | 2005 |
| 6 | John Vince, “Virtual Reality Systems”, Pearson Ed   | 2002 |

| B.Tech. Information Technology |                  |               |
|--------------------------------|------------------|---------------|
| Course code: Course Title      | Course Structure | Pre-Requisite |