XR by META (One Million One Billion & Flaunch)

Course Objectives	Course Outcomes
• Develop Proficiency in Physical Computing and Sensor Integration	• Build and program physical infrastructure using microcontrollers and sensors.
• Implement Cloud-Based IoT Solutions	• Utilize cloud computing services for data management and transport in IoT systems.
• Master 3D Modelling and Asset Creation	• Create and manipulate 3D models and assets using Blender.
• Integrate and Optimize Digital Twins	• Integrate digital and physical assets to develop Digital Twins within the Metaverse using Unity.
• Deploy and Visualize Industrial Metaverse Applications	• Develop and deploy applications for the Industrial Metaverse using VR technologies.

Course Duration: 45 Hours

Course Content:

UNIT I   Build physical infrastructure using microprocessor and sensors
Introduction to Metaverse and Physical environments - Introduction to microcontroller and sensors - What is analogue and digital data - Getting started with programming for microcontroller - How to Interface Sensors with a microcontroller

UNIT II   Build the transport layer for metaverse using Cloud computing
services Introduction to IoT and Cloud - Features of cloud and its initialization - How to read and write data to cloud - Integration of microcontroller and sensors from simulator with cloud

UNIT III   Create digital assets required for XR interaction by using a 3D modelling tool
Introduction to Blender - 3d modelling Structure - 3D assets and Textures - Creating a model for dam reservoir - Creating various farm states Activity performed - Build 3D Models - Texture 3D models - Animate 3D Models - Setup state machines - Bake and prepare environment for sensor data.

UNIT IV   Integrate digital and physical assets to create a Digital Twin in Metaverse
Introduction to Unity and packages - Optimization of 3D model - Introduction to REST API - Interfacing cloud data with unity - Testing Hardware and cloud with unity

UNIT V   Build Industrial Metaverse
Introduction to Oculus quest2 - How to integrate oculus quest2 with unity -Deploying project to oculus quest2 - Digital twins – Visualization and simulation using VR – Omniverse Digital twin platform – Industrial metaverse – Digital native

Test Projects:

Use Cases

1. Poultry Farming: Develop an industrial metaverse project where we would be creating a digital twin of "Poultry Farming". Poultry Farming is a domestic or commercial breeding of birds primarily for their meat, eggs, and feathers. In this instance, it is necessary to continuously monitor the real-time data in order to automate the feeding and temperature.
2. Green House: Constructing a digital twin for a Green House in which the environment is continuously monitored based on variables such as temperature, soil, humidity, and distance.
3. Automatic shutdown system: Building an automatic shutdown system in an industrial metaverse scenario like a large commercial structure. With the help of this digital twin system, all electrical equipment would switch off, if there were no people present.
4. Smart home technology: Creating a digital twin based on smart home technology in a large residential space where an automatic shutdown system is installed. Here the sensor receives the physical world data to find whether any human presence is around and would cause all electrical equipment to turn off.
5. Factory robot: Developing a digital twin that controls a factory robot to perform any pick-and- place tasks. These industrial metaverse robots are monitored to implement automated solutions like lifting or moving objects which do not require a lot of thought processes.
6. Gantry crane machine: A gantry crane machine can be used to carry objects horizontally as well as lift and lower them. The majority of its applications involve lifting big objects and moving them to new locations. We are developing a digital twin for monitoring and controlling the Gantry crane based on real-time data.
7. Supply chain system: A supply chain system plays a vital role in the production pipeline from raw goods to finished products. Conveyors are employed in these situations to facilitate simple and quick supply chain support. In order to incorporate industrial metaverse in supply chain management, a digital twin is deployed to control and observe the conveyor system.
8. Smart home energy monitor: Build a digital twin to implement a smart home energy monitor in order to measure numerous factors that affect the power flow, such as voltage dips and load current. In this system, the physical data is collected and sent to the virtual twin in order to boost the energy performance of the residential spaces using an industrial metaverse platform.
9. Milling: Milling is one of the most important steps in the production of rice. It is generally performed post the production of rice. There are a variety of operations that have to be performed during milling in order to make rice fit for the process. We are deploying a digital twin that can control the speed of the rice mill in order to achieve the best quality with smart technology.
10. Cement Mixer: Developing a digital twin that can be used for setting up the optimal ratio of a cement mixer by controlling the speed of the motor. This speed data of the physical machine is extracted and tweaked using the virtual twin.
11. Industrial Metaverse control for reservoir automation, management, and tracking