

**IVB.Tech I Semester (E.C.E)**

23A04705b	<b>INDUSTRIAL IOT AND AUTOMATION (SKILL COURSE)</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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**Course Objectives:**

1. To introduce the fundamentals of Industrial IoT (IIoT), its architecture, and its differences from traditional IoT.
2. To understand the components of IIoT, including sensors, actuators, and control systems, and their integration with embedded platforms.
3. To explore communication technologies such as ZigBee, Bluetooth, NFC, RFID, and MQTT for IIoT applications.
4. To study data visualization techniques, dashboard creation, and web-based connectivity for IIoT systems.
5. To learn data retrieval techniques, machine-to-machine (M2M) communication, and cloud integration for IIoT applications.
6. To implement automation using PLCs, SCADA, and real-time control systems for industrial applications.

**Course Outcomes:****After completing the course, the student will be able to,**

1. Explain the fundamental concepts of IIoT, its architecture, and the challenges associated with industrial automation.
2. Demonstrate the integration of sensors and actuators with Raspberry Pi/NodeMCU for real-time monitoring and control.
3. Implement communication protocols such as MQTT, ZigBee, and Bluetooth to enable seamless IIoT connectivity.
4. Develop web-based dashboards for real-time visualization and remote monitoring of IIoT devices.
5. Retrieve, analyze, and transmit industrial data using web-based interactions and M2M communication.
6. Implement PLC-based automation, ladder logic programming, and SCADA for supervisory control in industrial environments.

**(All the modules need to be conducted and minimum one project to be done)**

**MODULE 1: Introduction & Architecture**

What is IIoT and connected world? The difference between IoT and IIoT, Architecture of IIoT, IIoT node, Challenges of IIoT. Practice

1. Introduction to Arduino, Introduction to raspberry Pi.

<https://www.youtube.com/watch?v=AQdLQV6vhhbk>

**MODULE 2: IIoT Components**

Fundamentals of Control System, introductions, components, closed loop & open loop system.

Introduction to Sensors (Description and Working principle): What is sensor? Types of sensors, working principle of basic Sensors -Ultrasonic Sensor, IR sensor, MQ2, Temperature and Humidity Sensors (DHT-11).Digital switch, Electro Mechanical switches.

Practice

1. Measurement of temperature & pressure values of the process using raspberry pi/node mcu.
2. Modules and Sensors Interfacing (IR sensor, Ultrasonic sensors, Soil moisture sensor) using Raspberry pi/node mcu.
3. Modules and Actuators Interfacing (Relay, Motor, Buzzer) using Raspberry pi/node mcu.

### **MODULE 3: Communication Technologies of IIoT**

Communication Protocols: IEEE 802.15.4, ZigBee, Bluetooth, BLE, NFC, RFID Industry standards communication technology (MQTT), wireless network communication.

Practice

1. Demonstration of MQTT communication.

### **MODULE 4: Visualization and Data Types of IIoT**

Connecting an Arduino/Raspberry pi to the Web: Introduction, setting up the Arduino/Raspberry pi development environment, Options for Internet connectivity with Arduino, Configuring your Arduino/Raspberry pi board for the IoT.

Practice

1. Visualization of diverse sensor data using dashboard (part of IoT's 'control panel')
2. Sending alert message to the user. ways to control and interact with your environment)

### **MODULE 5: Retrieving Data**

Extraction from Web: Grabbing the content from a web page, Sending data on the web, Troubleshooting basic Arduino issues, Types of IoT interaction, Machine to Machine interaction (M2M).

Practice

1. Device control using mobile Apps or through Web pages.
2. Machine to Machine communication.

### **MODULE 6: Control & Supervisory Level of Automation**

Programmable logic controller (PLC), Real-time control system, Supervisory Control & Data Acquisition (SCADA).

Practice

1. Digital logic gates programming using ladder diagram.
2. Implementation of Boolean expression using ladder diagram.
3. Simulation of PLC to understand the process control concept.

**Projects:**

IIoT based smart energy meter

Smart Agriculture system

Automation using controller via Bluetooth

Temperature controlled Fan/cooler using controller

Automatic streetlight

Smart Baggage Tracker

**Textbooks**

1. The Internet of Things in the Industrial Sector, Mahmood, Zaigham (Ed.) (Springer Publication)
2. Industrial Internet of Things: Cybermanufacturing System, Sabina Jeschke, Christian Brecher, Houbing Song, Danda B. Rawat (Springer Publication)
3. Industrial IoT Challenges, Design Principles, Applications, and Security by Ismail Butun (editor)