Internet of Things workshop - Learning Outcomes

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Learning Outcomes

After completing the experiments outlined in this workshop, undergraduate students will be able to:

Experiment 1: Relay Control via Web Interface

- Understand how to control electronic devices like relays using a microcontroller (NodeMCU).
- Design and build a simple web interface for controlling devices in real-time.
- Explain how HTTP communication works between a browser and a microcontroller.
- Demonstrate the ability to toggle relays (ON/OFF) through a user-friendly web-page.

Experiment 2: Sending Real-Time Relay Status to a Java Server (GUI)

- Learn how to send data from a microcontroller to a server in real-time using HTTP POST requests.
- Understand the basics of data serialization in JSON format for communication between devices and servers.
- Develop a Java program to receive and display relay status updates dynamically.
- Gain hands-on experience in integrating IoT devices with server-side applications for visualization.

Experiment 3: Real-Time Analog Data Visualization (Webpage)

- Learn to read analog sensor data using a microcontroller's ADC (Analog-to-Digital Converter).
- Develop a webpage to display real-time sensor data using HTML and JavaScript.
- Understand the principles of dynamic data updates on web interfaces.
- Apply knowledge of data visualization to represent sensor readings in an easy-to-read format.

Experiment 4: Sending Real-Time Analog Pin Data Value to a Java Server

- Understand the process of collecting and sending sensor data from a microcontroller to a server.
- Build and configure a Java server to handle real-time data input.
- Create a graphical interface in Java to visualize incoming sensor data dynamically.
- Explore the practical applications of real-time data monitoring systems in IoT projects.

Overall Workshop Outcomes

- Gain a fundamental understanding of IoT systems and their components.
- Develop the ability to integrate hardware (NodeMCU) with software (web and server applications).
- Enhance programming skills in C++ (for NodeMCU), Java, HTML, and JavaScript.
- Learn to design real-time control and monitoring systems for practical applications.
- Build confidence in troubleshooting hardware-software communication issues.
- Prepare for advanced IoT and embedded system projects with hands-on experience.