INTRODUCTION TO IoT

INTERNET OF THINGS

Time: 60 mins

Introduction

In this class, the student/s will learn to create an electronic circuit with a blinking LED.

New Commands Introduced

● #define variableName value	Defines a variable with a value
● void setup()	The function that runs when the program starts.
● pinMode(pinNumber, mode)	Configures the specified pin to either input mode or output mode
● digitalWrite(pinNumber, HIGH/LOW)	Sets the digital output pin to either HIGH(5V) or LOW(0V)
● void loop()	Repeats the code inside continuosly
● delay(1000)	Pauses the code execution for the specified miliseconds

Vocabulary

- **IoT** (Internet of Things) refers to the collective network of connected devices and the technology that facilitates communication between devices and the cloud. As well as between the devices themselves.
- **Chasing effect** of lights is a simulation of motion of light which is achieved by turning them on and off in sequence.
- A **microprocessor board** is a printed circuit board containing a microprocessor and the minimal support logic needed for creating smart devices.
- A special kind of coding called **embedded programming** is used to make devices smart enough to communicate and perform task.
- **ESP32** board is a popular Wi-Fi and Bluetooth-enabled microcontroller, widely used for IoT projects.
- **WOKWI** is an online simulator to understand microprocessor connections and embedded programming.
- **LED** (Light-emmitting diode) is a semiconductor diode which glows when a voltage is applied.
- The positive end of an LED is called **Anode**.
- The negative end of an LED is called **Cathode**.
- A **resistor** is used for either limiting or regulating the flow of electric current in electrical circuit.

Learning Objectives

Student/s should be able to:

- ***Describe*** the uses of an IoT device.
- ***Explain*** how microprocessor boards are programmed using embedded programming.
- ***Demonstrate*** how to connect three LEDs on the circuit and program them to show a chasing effect.

Activities

1. **Class Narrative:** *(3 mins)*

    - Brief the student/s that the group of friends gather at the IoT kingdom for an extraordinary journey to become IoT wizards.

2. **Concept Introduction Activity:** *(4 mins)*

    - Let the student/s undertake the explore-activity to observe the working of chase effect.
    - Brief the student/s about the different microprocessor boards used for creating IoT devices.
    - Inform the student/s of the different parts of the ESP32 board and pins used to connect other devices to them.
    - Using the slides, explain that the student/s will learn:
        - to connect the LED.
        - to make the LED blink.
        - to add more LEDs.

3. **Activity 1: Connect the LED** *(16 mins)*

    Teacher Activity: *(8 mins)*

    - Explain the different uses of LEDs..
    - Demonstrate how to sign in to Wokwi, connect an LED and and resistor to the microprocessor board.
    - Explain the need for a resistor while connect an LED to the board.

    Student Activity: *(8 mins)*

    - Guide the student/s to connect the LED to the microprocessor..

4. **Activity 2: Make the LED Blink** *(10 mins)*

    Teacher Activity: *(5 mins)*

- Explain how variables are declared to store the pin numbers and how pins are set to either input mode or output mode.
- Demonstrate how to make the LED blink.

Student Activity: *(5 mins)*

- Guide the student/s to make the LED blink by programming the ESP32 board to initialize the output pin, setting the power to the LED, and turning it ON and OFF.

5. **Activity 3: Add More LEDs (***12 mins)*

Student Activity: *(12 mins)*

- Guide the students to add two more LEDs and program them to display a chase effect.

6. **Introduce the Post class project:** *(2 min)*
    - Create a simulation of a traffic light.
7. **Test and Summarize the class learnings:** *(5 mins)*
    - Check for understanding through quizzes and summarize learning after respective activities.
    - Summarize the overall class learning towards the end of the class.
8. **Additional activities:**
    - Encourage the student/s to reverse the light chaser effect.
    - Encourage the student/s to optimize the reverse chaser code.

9. **State the Next Class Objective:** *(1 min)*
    - In the next class, student/s will connect the devices and program ESP32 to creat a door bell.

U.S. Standards:

CSTA: 2-AP-11, 2-AP-12, 2-AP-13, 2-AP-14, 2-AP-19

Links Table		
Activity	**Activity Name**	**Link**
Class Presentation	Introduction to IoT	https://s3-whjr-curriculum-uploads.whjr.online/b63c6352-c77d-4c88-bfcd-d00b5707e2cf.html

Explore Activity	Introduction to IoT	https://wokwi.com/projects/384064045682698241
Teacher Activity 1	Connect the LED	https://wokwi.com/esp32
Teacher Reference: Teacher Activity 1 Solution	Connect the LED	https://wokwi.com/projects/384064734371767297
Student Activity 1	Connect the LED	https://wokwi.com/esp32
Teacher Reference: Student Activity 1 Solution	Connect the LED	https://wokwi.com/projects/384064246912846849
Teacher Activity 2	Make the LED Blink	https://wokwi.com/projects/384065040752079873
Teacher Reference: Teacher Activity 2 Solution	Make the LED Blink	https://wokwi.com/projects/384064139182134273
Student Activity 2	Make the LED Blink	https://wokwi.com/projects/384064547479851009
Teacher Reference: Student Activity 2 Solution	Make the LED Blink	https://wokwi.com/projects/384064614881272833
Student Activity 3	Add More LEDs	https://wokwi.com/projects/384074016633159681
Teacher Reference: Student Activity 3 Solution	Add More LEDs	https://wokwi.com/projects/384073024565829633
Student's Additional Activity 1	Reverse the Chase	https://wokwi.com/projects/384075578070025217
Teacher Reference: Student's Additional Activity 1 Solution	Reverse the Chase	https://wokwi.com/projects/384074444104115201
Student's Additional Activity 2	Optimize the Code	https://wokwi.com/projects/384076834849385473
Teacher Reference: Student's Additional Activity 2 Solution	Optimize the Code	https://wokwi.com/projects/384075851746295809
Post Class Project	Traffice Light	https://wokwi.com/projects/384077623897718785
Teacher Reference: Post Class Project Solution	Traffice Light	https://wokwi.com/projects/384077098714157057