ROBOTICS CLASSES – BEGINNERS

Creating a structured curriculum for beginners in **Robotics** ensures that learners grasp the fundamentals before moving on to more advanced projects.

Week 1: Introduction to Arduino

- **Objective**: Get familiar with Arduino, basic electronics, and the IDE.
- **Topics**:
  - What is Arduino? (History, applications, and versions of Arduino boards)
  - Overview of electronic components (LEDs, resistors, capacitors, sensors)
  - How to download and set up the Arduino IDE
  - Understanding Arduino pins (Digital vs. Analog pins)
  - First Program: **"Hello World"** with Arduino (Blink an LED)
- **Project**: Blinking an external LED using breadboard and resistors.

Week 2: Working with Inputs and Outputs

- **Objective**: Understand how to interact with sensors and components.
- **Topics**:
  - Input vs Output in Arduino
  - Controlling LEDs with push buttons
  - Using digital and analog signals (DigitalRead and AnalogRead)
  - Understanding pull-up and pull-down resistors

- **Project**: Button-controlled LED and potentiometer to control LED brightness.

Week 3: Serial Communication and Basic Sensors

- **Objective**: Learn how to use the serial monitor and basic sensors.
- **Topics**:
  - Introduction to **Serial Monitor** (Serial.begin, Serial.print, Serial.read)
  - Reading values from sensors (Light sensor, temperature sensor, ultrasonic sensor)
  - Displaying sensor data on the serial monitor
- **Project**: Measure the room temperature using an LM35 sensor and display the values on the serial monitor.

Week 4: PWM and Analog Control

- **Objective**: Learn Pulse Width Modulation (PWM) and control analog devices.
- **Topics**:
  - Introduction to PWM
  - Controlling the brightness of LEDs with **AnalogWrite**
  - Controlling servo motors using the **Servo library**
- **Project**: Controlling the position of a servo motor based on potentiometer input.

Week 5: Using Displays and More Sensors

- **Objective**: Learn to display information on an LCD and use more advanced sensors.
- **Topics**:
    - Introduction to LCD displays (16x2 LCD, I2C interface)
    - Using **Ultrasonic sensor (HC-SR04)** to measure distance
    - Display sensor data on the LCD screen
- **Project**: Build an ultrasonic distance meter with an LCD screen.

Week 6: Controlling DC Motors

- **Objective**: Understand how to control motors for basic robotics applications.
- **Topics**:
    - Introduction to motor drivers (L298N H-bridge)
    - Controlling DC motors with Arduino
    - Direction and speed control of motors using PWM
- **Project**: Build a simple motor-controlled robot using an L298N motor driver.

Week 7: Advanced Sensors and Actuators

- **Objective**: Work with additional sensors and actuators for more interactive projects.

- **Topics**:
    - Introduction to **IR sensors** (Line tracking, obstacle detection)
    - Using **Relays** to control high-voltage devices
    - Introduction to sound components (buzzer, piezo elements)
- **Project**: Build a simple line-following robot using IR sensors.

Week 8: Introduction to Wireless Communication

- **Objective**: Learn how to communicate wirelessly between devices.
- **Topics**:
    - Introduction to wireless communication (RF, Bluetooth, WiFi)
    - Setting up **Bluetooth module HC-05** with Arduino
    - Sending and receiving data over Bluetooth
- **Project**: Control an LED or servo motor wirelessly via a smartphone app.

Week 9: Introduction to IoT with Arduino

- **Objective**: Connect Arduino to the internet and control devices remotely.
- **Topics**:
    - Introduction to the **ESP8266 WiFi module**
    - Sending sensor data to the cloud
    - Controlling devices over the internet
- **Project**: Build a basic IoT project where temperature and humidity data are sent to a cloud service, and an LED is controlled via a web interface.

Week 10: Final Project: Arduino Robotics

- **Objective**: Apply all the knowledge gained in a comprehensive project.
- **Topics**:
    - Overview of robotics concepts (sensors, motors, movement)
    - Integrating sensors, motors, and communication modules in a single project
    - Testing and debugging the robot
- **Project**: Build an **obstacle-avoiding robot** or a **Bluetooth-controlled robot**.

Assessment:

- Weekly mini-project submissions.
- Mid-term quiz on Arduino basics.
- Final project presentation.

******