

IOT Learning Kit (ESP32)-V2

Internet of Things: IOT plays major role in industry 4.0 Revolution. The IOT learning Kit covers the practical implementation of IOT with Embedded Applications.

It includes the integration of WIFI certified IOT boards with IOT Clouds.

ESP32: ESP32 is a very suitable for IOT applications development with on chip WIFI Bluetooth. We can develop and deploy various IOT applications using ESP32.

ESP32 support Arduino IDE as programming Environment. We can integrate many IOT cloud with ESP32 Like:

- Blynk IOT Cloud
- Cayenne IOT Cloud
- Google IOT Cloud
- AWS IOT Core.
- And many more.....

On Board IOT Application Development:

1. **LED interfacing:** This Interfacing is to understand the OUTPUT operation of GPIO. Four LEDs available on the board with the line driving Transistor BC547. We can use any 4 GPIO of ESP32 to drive these LEDs. We can generate various pattern on led using Arduino programming, like
 - LED Blinking Pattern
 - LED Running Pattern
 - LED even odd change pattern
 - LED LSB-MSB interchange

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Use Button widget on IOT cloud Dashboard to control the switching of LED through internet.
2. **Switch interfacing:** This interfacing is to understand the INPUT operation of GPIO. Five PUSH to ON Switch available on the board. We can connect these switches with any GPIO of ESP32. We can develop various applications with switches using Arduino programming like:
 - Device ON/OFF control (in beginning we can use LED as device)
 - Controlling Various LED pattern using single Switch
 - Password Based Applications (with LCD)
 - Button press Counter (with LCD)

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Use LED widget on IOT Cloud. Control IOT Cloud Side LED, over the internet by pressing the switch connected with ESP32.
 - Use display widget on IOT Cloud and observe the button pressed count on IOT display over the internet.
3. **LCD interfacing:** A 16*2 LCD available on board having permanent connection with ESP32. This is the alphanumeric display mostly used in portable and hand-held device. With Arduino programming we can display various data on LCD like:
- Alphabetical Strings i.e. names (Temperature, Pressure, Menus, Passwords etc.)
 - Numerical Values like Counters, Temperature, Pressure, Humidity, etc.
 - Password based system using keypad or switches.
4. **Tiny OLED Display:** A Tiny Graphical OLED display available on board having permanent connection with ESP32. This is the alphanumeric Graphical display can be used to display various values or to design graphics using programming. With Arduino programming we can display various data on LCD like:
- Alphabetical Strings i.e. names (Temperature, Pressure, Menus, Passwords etc.)
 - Numerical Values like Counters, Temperature, Pressure, Humidity, etc.
 - Password based system using keypad or switches.
 - Graphics designing like Logos, Animation, etc.
5. **Temperature Sensor LM35 interfacing:** LM35 temperature Sensor available on board. With Arduino programming we can develop temperature-based application i.e.
- Temperature Display on LCD.
 - Temperature based automation.
 - Temperature threshold values setting using switches.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Use display widget on IOT Cloud and Monitor the temperature over the internet.
6. **MQ 135- Gas sensor:** This sensor available on board used to detect gases like, LPG, CO2, etc. This is the Analog Sensor and can be used with any analog input of ESP32. Using Arduino programming we can develop Gas monitoring and alerting applications. With Arduino programming we can develop Gas-Sensing based application i.e.
- Gas Level Display on LCD.
 - Gas level-based automation.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Use display widget on IOT Cloud and Monitor the Gas Level over the internet.
7. **LDR – Light Sensor:** This sensor available on board used to detect Light levels. This is the Analog Sensor and can be used with any analog input of ESP32. Using Arduino programming we can develop Light level monitoring and control applications.

PWM is the on-chip peripheral of ESP32. With PWM & Light sensor, using Arduino programming we can control the intensity of DC Light.

With Arduino programming we can develop Light Sensing based application i.e.

- Light Level Display on LCD.
- Light based automation.
- Automatic light switching system with Light level Monitoring.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Use display widget on IOT Cloud and Monitor the Light Level over the internet.
8. **IR Obstacle Sensor:** IR obstacle sensor is the digital output sensor. It can be used with any GPIO of ESP32 as digital input. We can develop obstacle detection-based application using Arduino programming like:
- Obstacle counting
 - Obstacle based automation (Alarm, Switching)

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
 - Connectivity of ESP32 with IOT Cloud using Internet.
 - Monitor Obstacle Count on IOT Cloud
9. **Ultrasonic Sensor Interfacing:** Ultrasonic Sensor HC-SR04 used to Measure distance with ESP32. With ultrasonic sensor, using Arduino Programming we can display distance on LCD and develop distance-based Applications.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
- Connectivity of ESP32 with IOT Cloud using Internet.
- Monitor Distance on IOT cloud.

10. **Relay Switch:** A relay is an electrically operated switch mostly used to control the switching of AC device with micro controllers. A SPDT relay Available on board to control the switching with ESP32 using programming.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
- Connectivity of ESP32 with IOT Cloud using Internet.
- Use Button widget on IOT Cloud. Control the Switching of relay over the internet.
- Control the AC device Connected with relay over the internet.

11. **Buzzer:** Buzzer used for alerting or alarming. A buzzer available on the board and connected with GPIO of ESP32. With Arduino programming we can turn on the buzzer for alerting or sound indication.

IOT Application Development using Arduino programming and IOT Cloud

- Connectivity of ESP32 with WIFI network.
- Connectivity of ESP32 with IOT Cloud using Internet.
- Use Button widget on IOT Cloud. Control the Buzzer switching over the internet.

