Control a 4-Channel Relay Module with ESP32 (Using 3 Relays)

Components Required:

1. ESP32 Development Board
2. 4-Channel Relay Module
3. 3 LEDs
4. 3 Resistors (220Ω or 330Ω each for LEDs)
5. Jumper Wires
6. Breadboard
7. External 5V Power Source (if required for Relay)

Circuit Diagram and Connections:

ESP32 GPIO Pin	Relay Module IN Pin
GPIO 5	IN1
GPIO 17	IN2
GPIO 16	IN3

Relay Output Side:

- Connect each relay's **NO (Normally Open) pin to one end of an LED + Resistor in series**.
- The other end of the resistor goes to the GND of the power supply.
- Common (COM) pin of each relay connects to **+5V (or appropriate supply)** for LEDs.

Relay Module Power:

- VCC ➔ 5V (ESP32 5V pin or external 5V)
- GND ➔ GND of ESP32
- IN1, IN2, IN3 ➔ GPIO pins (as above)

Note:
If relays are powered by an external 5V supply, **connect both ESP32 GND and Relay GND together**.

Important Notes:

1. **Relay Type:**
   Most relay modules are **Active LOW** — setting the GPIO pin to **LOW activates** the relay.

2. **ESP32 Power Limit:**
   ESP32's onboard 3.3V cannot drive relay coils — always power the relay module from **5V**.

3. **Relay Module Jumper:**
   If your relay has a **JD-VCC jumper**, remove it and power the relay side with a separate 5V

source for safety (especially when switching loads).

4. **LED Protection:**
   Always use **220Ω or 330Ω resistors** in series with LEDs to limit current.

5. **Switching Real Devices:**
   If switching AC appliances — use proper insulation, opto-isolation, and safety measures.

ESP32 Relay Control Code:

```
#include <Arduino.h>
#define in1 5
#define in2 17
#define in3 16

void setup() {
  pinMode(in1,OUTPUT);
  pinMode(in2,OUTPUT);
  pinMode(in3,OUTPUT);
}

void loop() {
  digitalWrite(in1,LOW);
  delay(1000);
  digitalWrite(in1,HIGH);
  delay(1000);

  digitalWrite(in2,LOW);
  delay(1000);
  digitalWrite(in2,HIGH);
  delay(1000);

  digitalWrite(in3,LOW);
  delay(1000);
  digitalWrite(in3,HIGH);
  delay(1000);
}
```

Final Working Explanation:

1. ESP32 sets relay IN pins to **LOW to turn ON** the relay.
2. This connects the **NO and COM pins inside the relay**.
3. When NO and COM are connected, the **external 5V passes through the LED + Resistor**, lighting the LED.
4. After 1 second delay, ESP32 sets pin **HIGH to turn OFF** the relay.
5. This process repeats for all three relays.

Image :