```
#include <WiFi.h>
#include <Firebase_ESP_Client.h>

// ---------- USER SETTINGS ----------
#define WIFI_SSID     "Mamatha"
#define WIFI_PASSWORD "mamatha123"

#define API_KEY       "AIzaSyDD0oSM_wqSgAxqn9Qr3Bre4433AmloJmc"
#define DATABASE_URL  "https://esp32-6ea6c-default-rtdb.asia-southeast1.firebasedatabase.app/"  // with trailing /

#define USER_EMAIL    "229X1A0419@gprec.ac.in"
#define USER_PASSWORD "Mamatha@123"

// ---------- HARDWARE  ----------
const uint8_t SOIL_PIN = 33;      // on ESP8266: 0-1023 counts (0-1 V unless scaled)
const uint32_t SAMPLE_PERIOD_MS = 5000;

// ------------------------------------

// Firebase objects
FirebaseData fbdo;
FirebaseAuth auth;
FirebaseConfig config;

unsigned long lastSent = 0;

void connectWiFi() {
  WiFi.mode(WIFI_STA);
  WiFi.begin(WIFI_SSID, WIFI_PASSWORD);
  Serial.print("Connecting to WiFi");
  while (WiFi.status() != WL_CONNECTED) {
    Serial.print('.');
    delay(500);
  }
  Serial.println(" □");
  Serial.print("IP: ")
Serial.println(WiFi.localIP());
```

```
}


void setupFirebase() {
  config.api_key = API_KEY;
  config.database_url = DATABASE_URL;


  // Optional email/password authentication
  auth.user.email = USER_EMAIL;
  auth.user.password = USER_PASSWORD;
  // Reconnect Wi-Fi automatically
//  config.wifi_clear_auto_reconnect = false;
  Firebase.begin(&config, &auth);
  Firebase.reconnectWiFi(true);
}
void setup() {
  Serial.begin(115200);
  delay(500);
  connectWiFi();
  setupFirebase();
  // Calibrate ADC range if you use an external divider → comment next line
  //analogReference(AR_DEFAULT); // 1.0 V on NodeMCU; comment out for boards with 3.3 V ADC
}
void loop() {
  unsigned long now = millis();
  if (now - lastSent >= SAMPLE_PERIOD_MS || lastSent == 0) {
    int   raw     = analogRead(SOIL_PIN);           // 0–4095
    float percent = map(raw, 4095, 0, 0, 100);      // dry=0 %, wet=100 %


    Serial.printf("Soil raw=%d  moisture=%.1f%%\n", raw, percent);


    // --- Realtime-DB node paths ----------------------------------
```

```
    const char* pathRaw   = "/sensors/soilRaw";       // ADC counts
    const char* pathMoist = "/sensors/soilMoisture";  // %
    const char* timePath  = "/sensors/timestamp";     // Unix time

    // ------------------------------------------------------------


    // Upload raw value first (order doesn't really matter)
    Firebase.RTDB.setInt  (&fbdo, pathRaw,   raw);


    // Upload percentage and check for success
    if (Firebase.RTDB.setFloat(&fbdo, pathMoist, percent)) {
      Serial.println("□ Uploaded moisture");
    } else {
      Serial.printf("✗ Upload failed: %s\n", fbdo.errorReason().c_str());
    }


    // Upload timestamp (optional)
    Firebase.RTDB.setInt(&fbdo, timePath, (int)Firebase.getCurrentTime());
    lastSent = now;
  }


  // Keep the Firebase connection alive
  Firebase.RTDB.readStream(&fbdo);
}
```