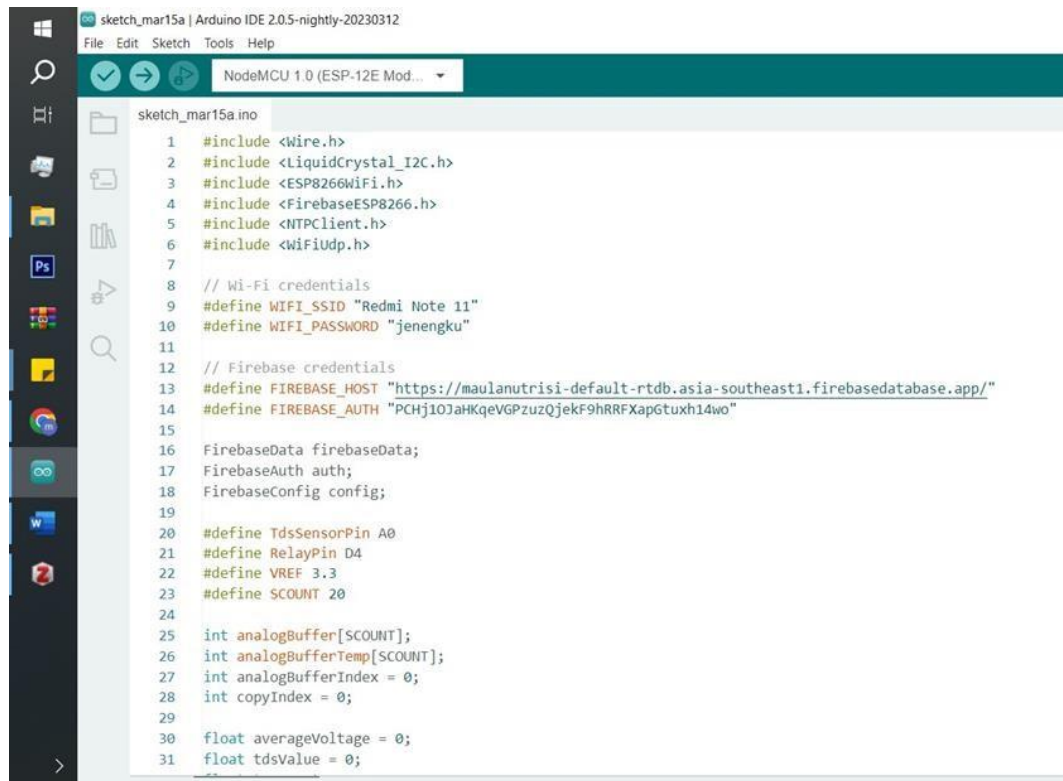


LAMPIRAN

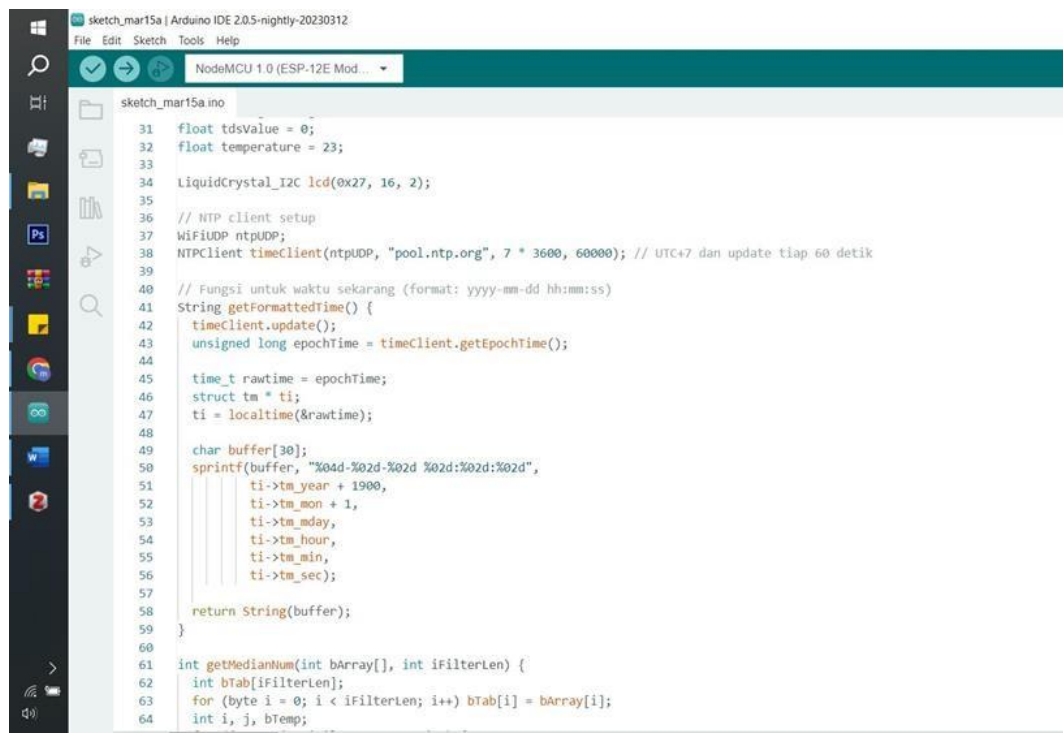
1. Kode Program Arduino IDE



```
sketch_mar15a | Arduino IDE 2.0.5-nightly-20230312
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NodeMCU 1.0 (ESP-12E Mod...

sketch_mar15a.ino
1  #include <Wire.h>
2  #include <LiquidCrystal_I2C.h>
3  #include <ESP8266WiFi.h>
4  #include <FirebaseESP8266.h>
5  #include <NTPClient.h>
6  #include <WiFiUDP.h>
7
8  // Wi-Fi credentials
9  #define WIFI_SSID "Redmi Note 11"
10 #define WIFI_PASSWORD "jenengku"
11
12 // Firebase credentials
13 #define FIREBASE_HOST "https://maulanutrisi-default-rtdb.asia-southeast1.firebaseio.com/"
14 #define FIREBASE_AUTH "PCHj1OJaHKqevGPzuzQjekF9hRRFXapGtuxh14wo"
15
16 FirebaseData firebaseData;
17 FirebaseAuth auth;
18 FirebaseConfig config;
19
20 #define TdsSensorPin A0
21 #define RelayPin D4
22 #define VREF 3.3
23 #define SCOUNT 20
24
25 int analogBuffer[SCOUNT];
26 int analogBufferTemp[SCOUNT];
27 int analogBufferIndex = 0;
28 int copyIndex = 0;
29
30 float averageVoltage = 0;
31 float tdsValue = 0;
```



```
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NodeMCU 1.0 (ESP-12E Mod...

sketch_mar15a.ino
31 float tdsValue = 0;
32 float temperature = 23;
33
34 LiquidCrystal_I2C lcd(0x27, 16, 2);
35
36 // NTP client setup
37 WiFiUDP ntpUDP;
38 NTPClient timeClient(ntpUDP, "pool.ntp.org", 7 * 3600, 60000); // UTC+7 dan update tiap 60 detik
39
40 // Fungsi untuk waktu sekarang (format: yyyy-mm-dd hh:mm:ss)
41 String getFormattedTime() {
42   timeClient.update();
43   unsigned long epochTime = timeClient.getEpochTime();
44
45   time_t rawtime = epochTime;
46   struct tm * ti;
47   ti = localtime(&rawtime);
48
49   char buffer[30];
50   sprintf(buffer, "%04d-%02d-%02d %02d:%02d:%02d",
51           ti->tm_year + 1900,
52           ti->tm_mon + 1,
53           ti->tm_mday,
54           ti->tm_hour,
55           ti->tm_min,
56           ti->tm_sec);
57
58   return String(buffer);
59 }
60
61 int getMedianum(int bArray[], int iFilterLen) {
62   int bTab[iFilterLen];
63   for (byte i = 0; i < iFilterLen; i++) bTab[i] = bArray[i];
64   int i, j, bTemp;
```

```
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NodeMCU 1.0 (ESP-12E Mod...)

sketch_mar15a.ino
61 int getMedianum(int bArray[], int ifilterLen) {
62   int bTab[ifilterLen];
63   for (byte i = 0; i < ifilterLen; i++) bTab[i] = bArray[i];
64   int i, j, bTemp;
65   for (j = 0; j < ifilterLen - 1; j++) {
66     for (i = 0; i < ifilterLen - j - 1; i++) {
67       if (bTab[i] > bTab[i + 1]) {
68         bTemp = bTab[i];
69         bTab[i] = bTab[i + 1];
70         bTab[i + 1] = bTemp;
71       }
72     }
73   }
74   return (ifilterLen & 1) ? bTab[(ifilterLen - 1) / 2] : (bTab[ifilterLen / 2] + bTab[ifilterLen / 2 - 1]) / 2;
75 }
76
77 void setup() {
78   Serial.begin(9600);
79   pinMode(TdsSensorPin, INPUT);
80   pinMode(RelayPin, OUTPUT);
81   digitalWrite(RelayPin, LOW);
82
83   lcd.init();
84   lcd.backlight();
85   lcd.clear();
86
87   Wifi.begin(WIFI_SSID, WIFI_PASSWORD);
88   Serial.print("Connecting to Wi-Fi");
89   while (Wifi.status() != WL_CONNECTED) {
90     delay(500);
91     Serial.print(".");
92   }
93   Serial.println("\nWi-Fi Connected");
94 }
```

```
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NodeMCU 1.0 (ESP-12E Mod...)

sketch_mar15a.ino
94
95   timeClient.begin();
96
97   // Konfigurasi Firebase
98   config.host = FIREBASE_HOST;
99   config.signer.tokens.legacy_token = FIREBASE_AUTH;
100
101   Firebase.begin(&config, &auth);
102   Firebase.reconnectWiFi(true);
103 }
104
105 void loop() {
106   static unsigned long analogSampleTimepoint = millis();
107   if (millis() - analogSampleTimepoint > 400) {
108     analogSampleTimepoint = millis();
109     analogBuffer[analogBufferIndex] = analogRead(TdsSensorPin);
110     analogBufferIndex++;
111     if (analogBufferIndex == SCOUNT) analogBufferIndex = 0;
112   }
113
114   static unsigned long printTimepoint = millis();
115   if (millis() - printTimepoint > 60000) {
116     printTimepoint = millis();
117
118     // Update waktu dari NTP client dulu
119     timeClient.update();
120     unsigned long epochTime = timeClient.getEpochTime();
121     time_t rawtime = epochTime;
122     struct tm * ti = localtime(&rawtime);
123
124     int currentHour = ti->tm_hour;
125     int currentMinute = ti->tm_min;
126 }
```

```
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NodeMCU 1.0 (ESP-12E Mod...)

sketch_mar15a.ino
127 // Cek apakah waktu sekarang di rentang 19:00 sampai 19:15
128 bool isInTimeRange = (currentHour == 11) && (currentMinute >= 00 && currentMinute <= 15);
129
130 if (isInTimeRange) {
131     // Copy buffer ke temporary
132     for (copyIndex = 0; copyIndex < SCOUNT; copyIndex++) {
133         analogBufferTemp[copyIndex] = analogBuffer[copyIndex];
134     }
135
136     averageVoltage = getMedianHum(analogBufferTemp, SCOUNT) * (float)VREF / 1024.0;
137     float compensationCoefficient = 1.0 + 0.02 * (temperature - 25.0);
138     float compensationVoltage = averageVoltage / compensationCoefficient;
139     tdsValue = (133.42 * pow(compensationVoltage, 3) - 255.86 * pow(compensationVoltage, 2) + 857.39 * compensationVoltage) * 0.5;
140
141     // Ambil waktu sekarang dalam string format
142     String waktu = getFormattedTime(); // contoh: "2025-05-25 14:30:45"
143     String tanggal = waktu.substring(0, 10); // yyyy-mm-dd
144     String jam = waktu.substring(11); // hh:mm:ss
145
146     Serial.print("waktu: ");
147     Serial.print(waktu);
148     Serial.print(" | TDS Value: ");
149     Serial.print(tdsValue, 0);
150     Serial.println(" ppm");
151
152     // Logic untuk ganti tampilan jam/tanggal
153     static unsigned long lastSwitchTime = 0;
154     static bool showDate = true;
155
156     if (millis() - lastSwitchTime > 3000) {
157         lastSwitchTime = millis();
158         showDate = !showDate;
159     }
160
161     // Tampilkan di LCD
162     lcd.clear();
163     lcd.setCursor(0, 0);
164     lcd.print("TDS:");
165     lcd.print(tdsValue, 0);
166     lcd.print("ppm");
167
168     lcd.setCursor(0, 1);
169     if (showDate) {
170         lcd.print("Tgl: ");
171         lcd.print(tanggal);
172     } else {
173         lcd.print("Jam: ");
174         lcd.print(jam);
175     }
176
177     // Kirim data ke Firebase
178     if (Firebase.ready()) {
179         String pathRiwayat = "/TDS/Riwayat";
180         String pathTerbaru = "/TDS/Terbaru";
181         String waktuAsli = getFormattedTime();
182
183         FirebaseJson json;
184         json.add("ppm", tdsValue);
185         json.add("waktu", waktuAsli);
186
187         // Push ke Riwayat
188         if (Firebase.pushJSON(firebaseData, pathRiwayat, json)) {
189             Serial.println("Data TDS berhasil dikirim ke Firebase Riwayat.");
190         } else {
191             Serial.print("Firebase error (Riwayat): ");
192             Serial.println(firebaseData.errorReason());
193         }
194     }
```

```
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NodeMCU 1.0 (ESP-12E Mod...)

sketch_mar15a.ino
161 // Tampilkan di LCD
162 lcd.clear();
163 lcd.setCursor(0, 0);
164 lcd.print("TDS:");
165 lcd.print(tdsValue, 0);
166 lcd.print("ppm");
167
168 lcd.setCursor(0, 1);
169 if (showDate) {
170     lcd.print("Tgl: ");
171     lcd.print(tanggal);
172 } else {
173     lcd.print("Jam: ");
174     lcd.print(jam);
175 }
176
177 // Kirim data ke Firebase
178 if (Firebase.ready()) {
179     String pathRiwayat = "/TDS/Riwayat";
180     String pathTerbaru = "/TDS/Terbaru";
181     String waktuAsli = getFormattedTime();
182
183     FirebaseJson json;
184     json.add("ppm", tdsValue);
185     json.add("waktu", waktuAsli);
186
187     // Push ke Riwayat
188     if (Firebase.pushJSON(firebaseData, pathRiwayat, json)) {
189         Serial.println("Data TDS berhasil dikirim ke Firebase Riwayat.");
190     } else {
191         Serial.print("Firebase error (Riwayat): ");
192         Serial.println(firebaseData.errorReason());
193     }
194 }
```

```

// Set/Update data Terbaru (overwrite data sebelumnya)
if (Firebase.setJSON(firebaseData, pathTerbaru, json)) {
    Serial.println("Data TDS berhasil diupdate ke Firebase Terbaru.");
} else {
    Serial.print("Firebase error (Terbaru): ");
    Serial.println(firebaseData.errorReason());
}
}

// Kontrol Relay
if (tdsValue > 50) {
    digitalWrite(RelayPin, HIGH);
} else {
    digitalWrite(RelayPin, LOW);
}

else {
    // Jika di luar jam 19:00-19:15, tampilkan pesan dan matikan relay
    lcd.clear();
    lcd.setCursor(0, 0);
    lcd.print("Diluar Waktu");
    lcd.setCursor(0, 1);
    lcd.print("Pengukuran Off");
    digitalWrite(RelayPin, LOW);
    Serial.println("Di luar jam pengambilan data.");
}

```

2. Gambar Nilai TDS Di Layar LCD







3. Tampilan Notifikasi

