LAMPIRAN – LAMPIRAN

Lampiran 1. Pengkodean Pada Arduino dengan Aplikasi Arduino Ide 2.0

```
#include <RTClib.h>
#include <Wire.h>
#include <SoftwareSerial.h>
#include <ArduinoJson.h>
#include <DHT.h>
#include <DHT_U.h>
#include <Adafruit_Sensor.h>
//#include "ACS712.h"
#include <SPI.h>
//#include <SD.h>

#define DHTPIN A0
#define LDR A1
#define ACS_Pin A2
#define VIN A3
#define NUM_SAMPLES 10
const int chipSelect = 4;


/*
* SENSOR DHT = A0
* SENSOR LDR = A1
* SENSOR ARUS = A2
* SENSOR TEGANGAN = A3
*/


//File myFile;

SoftwareSerial s(5,6); // RX, TX
RTC_DS3231 rtc;
char daysOfTheWeek[7][12] = {"Sunday", "Monday", "Tuesday", "Wednesday", "Thursday",
 "Friday", "Saturday"};

// ACS712 5A, 185 mV per A
// ACS712 20A, 100 mV per A
// ACS712 30A, 66 mV per A
// ACS712 ACS(A2, 5.0, 1023, 66);
//

int sum = 0;                  // sum of samples taken
```

```
unsigned char sample_count = 0; // current sample number
float voltage = 0.0;        // calculated voltage
int kondisi = 0;
int ulang = 0;
float vcc; float curr;
float AcsValue = 0.0;
float Samples = 0.0;
float AvgAcs = 0.0;
unsigned int x = 0;


#define DHTTYPE DHT22
 DHT dht(DHTPIN, DHTTYPE);
```

// Coding mengimpan data dalam bentuk buffer & jSon untuk di kirimkan ke NodeMCU tiap 100 miliSecond

```
StaticJsonBuffer<100> jsonBuffer;
JsonObject& root = jsonBuffer.createObject();

void setup() {
   Serial.begin(115200);
   s.begin(115200);
   dht.begin();
   rtc.begin();
   if (! rtc.begin()) {
          Serial.println("Couldn't find RTC");
          while (1); }


if (rtc.lostPower()) {
    Serial.println("RTC lost power, lets set the time!");
    // following line sets the RTC to the date & time this sketch was compiled
 rtc.adjust(DateTime(F(__DATE__), F(__TIME__)));
    // This line sets the RTC with an explicit date & time, for example to set
    // April 10, 2023 at 3am you would call:
   // rtc.adjust(DateTime(2023, 4, 10, 3, 0, 0));
}
```

// Coding sensor LDR

```
float cahaya = analogRead(LDR);
float terang = cahaya * 100.0 / 1023.0;
voltage = analogRead(VIN);
```

```
vcc = (voltage * 48) / 982.08;
if (vcc > 48){
}
//ACS.autoMidPoint(); // Opsi agar ACS menghitung mulai dari besar arus sekarang
 //ACS.setMidPoint(512); // Opsi untuk menghitung besar arus mulai dari 0 Volt

kondisi = 1;
ulang = 0;
}

void loop() {
DateTime now = rtc.now();
Serial.print(now.year());
  Serial.print('/');
  Serial.print(now.month());
  Serial.print('/');
  Serial.print(now.day());
  Serial.print(" (");
  Serial.print(daysOfTheWeek[now.dayOfTheWeek()]);
  Serial.print(") ");
  Serial.print(now.hour());
  Serial.print(':');
  Serial.print(now.minute());
  Serial.print(':');
  Serial.print(now.second());
  Serial.println();

// Coding sensor Arus (ACS712)
AcsValue = analogRead(A2);      //Read current sensor values
Samples = (AcsValue / 1024.0) * 5015.0; //Add samples together
float arus = ((Samples - 2520.0) / 66);

// Coding sensor LDR
float cahaya = analogRead(LDR);
float terang = cahaya * 100.0 / 1023.0;
  voltage = analogRead(VIN);
     vcc = (voltage * 48) / 982.08;
     if (vcc > 48){
      vcc = 48;
  }
  else{

  }
```

```
// Coding sensor DHT22
float h = dht.readHumidity();
// Read temperature as Celsius (the default)
float t = dht.readTemperature();
delay(500);


// Coding mengirim data ke NodeMCU
 root["temp"] = t;
root["hum"] = h;
 root["Lig"] = terang;
root["tegangan"] = vcc;
root["arus"] = arus;
 root.printTo(s); // Mengirim data ke NodeMCU


if(s.available()>0)
{
 // Coding menampilkan semua data sensor ke monitor PC
Serial.print("Temp: ");
Serial.println(t);
Serial.print("Hum: ");
Serial.println(h);
Serial.print("Intensitas: ");
Serial.print(terang);
Serial.println(" %");
Serial.print("V: ");
Serial.print(vcc,1);
Serial.println(" V");
Serial.print("Arus: ");
Serial.print(arus);
Serial.println(" A");
//*Serial.print("Kondisi: ");
Serial.println(AcsValue);/
/Serial.println(ACS.getMidPoint());*/
 Serial.println(""); }
else{
 Serial.println("NodeMCU not connected!");
}
delay(2000);
```

```
}
```

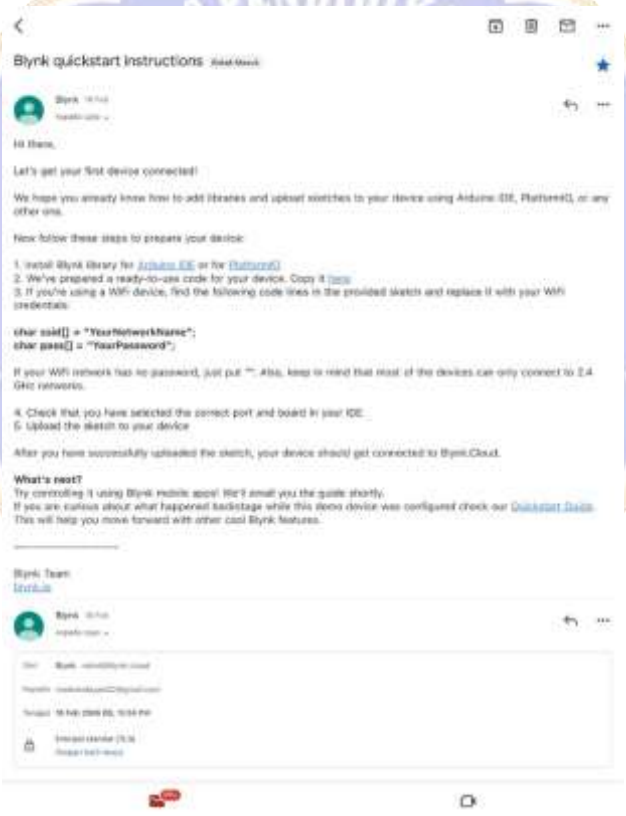
PROGRAM NODEMCU

```
#include<ESP8266WiFi.h>
#define BLYNK_PRINT Serial
#include <BlynkSimpleEsp8266.h>
#include <SoftwareSerial.h> SoftwareSerial s(D5,D6);
// RX, TX
#include <ArduinoJson.h>

char auth[] = "RkL3SyZ7LWNfFdvxsw7ggXGqoO8U0xw2";
char ssid[] = "wifi-aslam";
char pass[] = "aslam161";

BlynkTimer timer;

void setup() {
  // Initialize Serial port
  Serial.begin(115200);
  Blynk.begin(auth, ssid, pass);
  s.begin(115200);
  while (!Serial) continue;
}

void loop() {
StaticJsonBuffer<1000> jsonBuffer;
  JsonObject& root = jsonBuffer.parseObject(s);

  if (root == JsonObject::invalid())
 {
   return;
}
int data1=root["temp"];
int data2=root["hum"];
int data3 = root["Lig"];
float data4 = root["arus"];
float data6 = root["tegangan"];
 int h = data1;
int t = data2;
int c = data3;
float d = data4;
float f = data6;
```

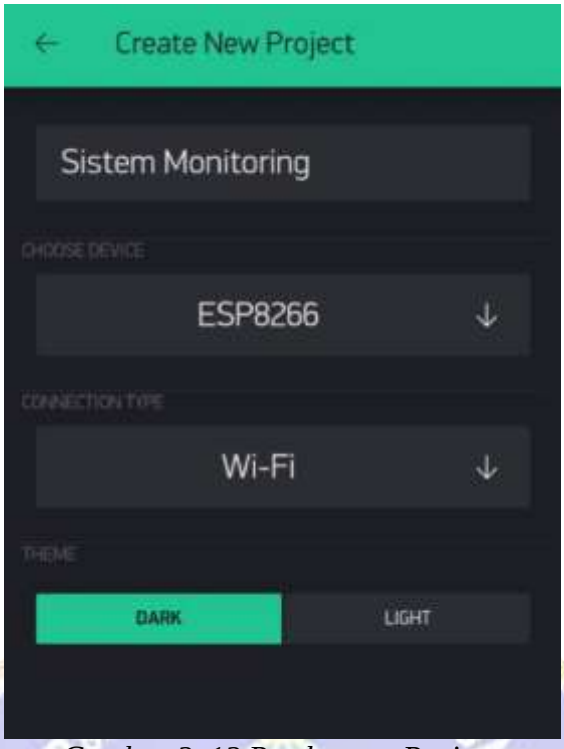
```
Blynk.virtualWrite(V0,h);
Blynk.virtualWrite(V1,t);
Blynk.virtualWrite(V2,c);
Blynk.virtualWrite(V3,f);
Blynk.virtualWrite(V4,d);
Serial.write(s);
Serial.write("dtrydtyfdc");
 Blynk.run();
 delay(1000);
}
```

Lampiran 2. Perancangan *Sofware* Penampil *Blynk*

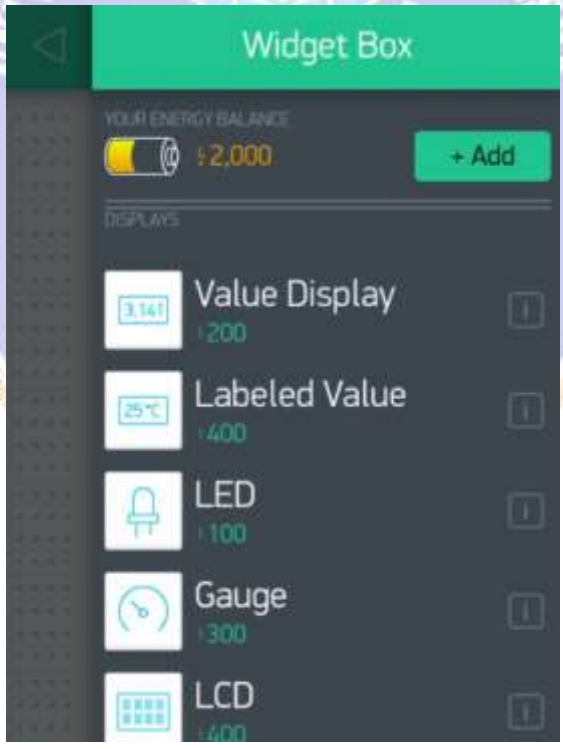
Gambar 2. 10 Tampilan Aplikasi Blynk



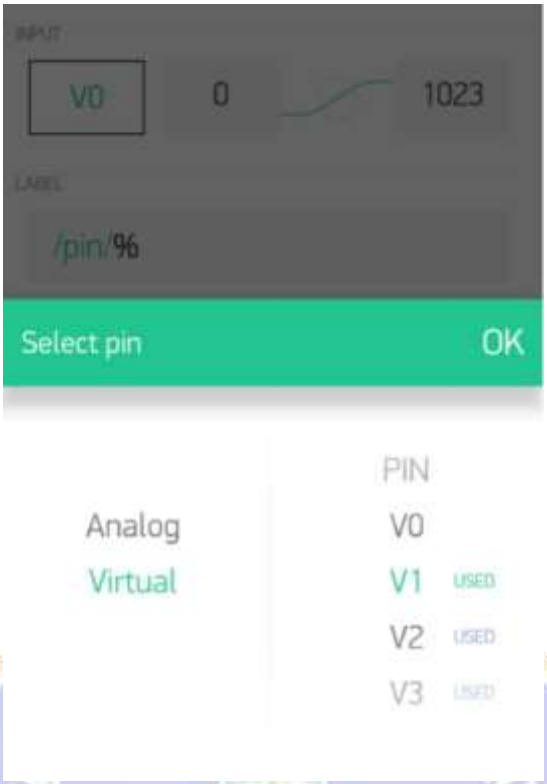
Gambar 2. 11 Pendaftaran ID Pengguna



Gambar 2. 12 Pembuatan Project



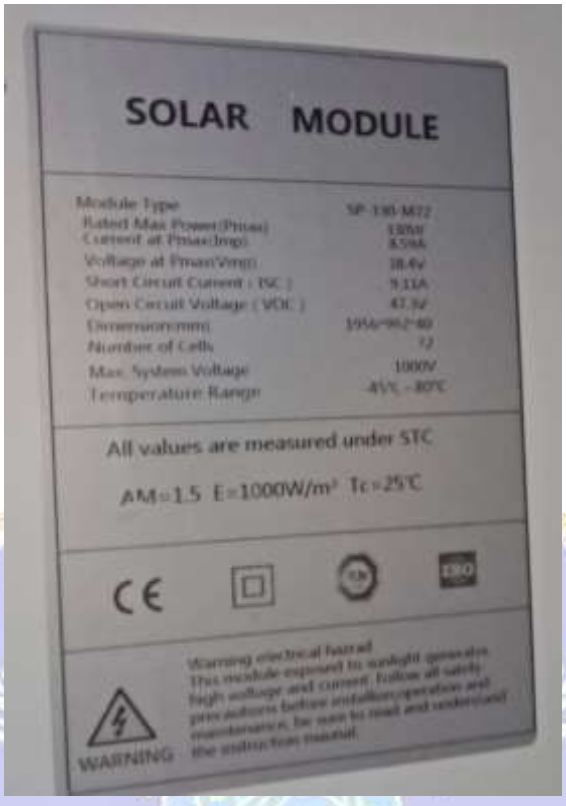
Gambar 2. 13 Pembuatan Board Penampil Sistem Monitoring



Gambar 2. 14 Pengaturan Besaran Penampil

Gambar 2. 15 Hasil Akhir Penampilan data Monitoring Photovoltaic

Lampiran 3. Sistem Monitoring Photovoltaic



Gambar 3. 3 Spesifikasi Photovoltaic

Gambar 3. 4 Pemasangan Photovoltaic

Gambar 3. 5 Penempatan dan Pengukuran Menggunakan Alat Monitoring yang Dikembangkan

Gambar 3. 6 Hasil Pengukuran

Lampiran 4. Tabel Nilai Bantu

Tabel 4.1 Nilai Bantu Perhitungan Regresi Sampel Data pada Variabel Terukur

No	X_1	X_2	X_3	Y	X1Y	X2Y	X3Y	X_1X_2	X_1X_3	X_2X_3	X_1^2	X_2^2	X_3^2	Y^2
1	34.2	1.6	2	54.72	1871.424	87.552	1586.88	54.72	991.8	46.4	1169.64	2.56	2994.278	2994.278
2	34.9	1.8	28	62.82	2192.418	113.076	1758.96	62.82	977.2	50.4	1218.01	3.24	3946.352	3946.352
3	35.5	2.2	29	46.15	1638.325	101.53	1338.35	78.1	1029.5	63.8	1260.25	4.84	2129.823	2129.823
4	36.2	1.3	30	47.06	1703.572	61.178	1411.8	47.06	1086	39	1310.44	1.69	2214.644	2214.644
5	40.9	1.4	33	57.26	2341.934	80.164	1889.58	57.26	1349.7	46.2	1672.81	1.96	3278.708	3278.708
6	41.2	3.1	30	127.72	5262.064	395.932	3831.6	127.72	1236	93	1697.44	9.61	16312.4	16312.4
7	39.8	2.8	29	111.44	4435.312	312.032	3231.76	111.44	1154.2	81.2	1584.04	7.84	12418.87	12418.87
8	35.3	2.4	27	84.72	2990.616	203.328	2287.44	84.72	953.1	64.8	1246.09	5.76	7177.478	7177.478
9	34.9	1.9	26	66.31	2314.219	125.989	1724.06	66.31	907.4	49.4	1218.01	3.61	4397.016	4397.016
10	32.6	1.6	24	52.16	1700.416	83.456	1251.84	52.16	782.4	38.4	1062.76	2.56	2720.666	2720.666
11	32.2	4.3	31	138.46	4458.412	595.378	4292.26	138.46	998.2	133.3	1036.84	18.49	19171.17	19171.17
12	28.3	2.9	31	82.07	2322.581	238.003	2544.17	82.07	877.3	89.9	800.89	8.41	6735.485	6735.485
13	28	3.7	29	103.6	2900.8	383.32	3004.4	103.6	812	107.3	784	13.69	10732.96	10732.96
14	32.9	2.3	29	75.67	2489.543	174.041	2194.43	75.67	954.1	66.7	1082.41	5.29	5725.949	5725.949
15	35.2	1.9	27	66.88	2354.176	127.072	1805.76	66.88	950.4	51.3	1239.04	3.61	4472.934	4472.934

16	34.8	3.6	26	125.28	4359.744	451.008	3257.28	125.28	904.8	93.6	1211.04	12.96	15695.08	15695.08
17	34.1	3.2	29	109.12	3720.992	349.184	3164.48	109.12	988.9	92.8	1162.81	10.24	11907.17	11907.17
18	33.3	2.7	30	89.91	2994.003	242.757	2697.3	89.91	999	81	1108.89	7.29	8083.808	8083.808
19	28.4	1.9	28	53.96	1532.464	102.524	1510.88	53.96	795.2	53.2	806.56	3.61	2911.682	2911.682
20	28	3	26	84	2352	252	2184	84	728	78	784	9	7056	7056
21	32.4	1.2	25	38.88	1259.712	46.656	972	38.88	810	30	1049.76	1.44	1511.654	1511.654
22	344	1.9	25	65.36	22483.84	124.184	1634	653.6	8600	47.5	118336	3.61	4271.93	4271.93
23	32.9	2.3	27	75.67	2489.543	174.041	2043.09	75.67	888.3	62.1	1082.41	5.29	5725.949	5725.949
24	33.4	2.5	28	83.5	2788.9	208.75	2338	83.5	935.2	70	1115.56	6.25	6972.25	6972.25
25	38.3	1.2	30	45.96	1760.268	55.152	1378.8	45.96	1149	36	1466.89	1.44	2112.322	2112.322
26	36.7	3	31	110.1	4040.67	330.3	3413.1	110.1	1137.7	93	1346.89	9	12122.01	12122.01
27	34	3.1	30	105.4	3583.6	326.74	3162	105.4	1020	93	1156	9.61	11109.16	11109.16
28	34.2	2.9	29	99.18	3391.956	287.622	2876.22	99.18	991.8	84.1	1169.64	8.41	9836.672	9836.672
29	33.5	2.2	27	73.7	2468.95	162.14	1989.9	73.7	904.5	59.4	1122.25	4.84	5431.69	5431.69
30	31.3	2.6	25	81.38	2547.194	211.588	2034.5	81.38	782.5	65	979.69	6.76	6622.704	6622.704
31	40.9	1.4	29	57.26	2341.934	80.164	1660.54	57.26	1186.1	40.6	1672.81	1.96	3278.708	3278.708
32	39.8	2.4	28	95.52	3801.696	229.248	2674.56	95.52	1114.4	67.2	1584.04	5.76	9124.07	9124.07
33	37.5	1.9	30	71.25	2671.875	135.375	2137.5	71.25	1125	57	1406.25	3.61	5076.563	5076.563

34	38.4	3.9	30	149.76	5750.784	584.064	4492.8	149.76	1152	117	1474.56	15.21	22428.06	22428.06
35	37.2	2.3	28	85.56	3182.832	196.788	2395.68	85.56	1041.6	64.4	1383.84	5.29	7320.514	7320.514
36	39.3	2	29	78.6	3088.98	157.2	2279.4	78.6	1139.7	58	1544.49	4	6177.96	6177.96
37	38.1	3.1	30	118.11	4499.991	366.141	3543.3	118.11	1143	93	1451.61	9.61	13949.97	13949.97
38	38.2	3	29	114.6	4377.72	343.8	3323.4	114.6	1107.8	87	1459.24	9	13133.16	13133.16
39	39.3	2.4	29	94.32	3706.776	226.368	2735.28	94.32	1139.7	69.6	1544.49	5.76	8896.262	8896.262
40	37	1.8	28	66.6	2464.2	119.88	1864.8	66.6	1036	50.4	1369	3.24	4435.56	4435.56
41	33.8	1.8	28	60.84	2056.392	109.512	1703.52	60.84	946.4	50.4	1142.44	3.24	3701.506	3701.506
42	35.2	1.7	29	59.84	2106.368	101.728	1735.36	59.84	1020.8	49.3	1239.04	2.89	3580.826	3580.826
43	40	1.7	30	68	2720	115.6	2040	68	1200	51	1600	2.89	4624	4624
44	36.7	2	30	73.4	2693.78	146.8	2202	73.4	1101	60	1346.89	4	5387.56	5387.56
45	33.4	2.9	31	96.86	3235.124	280.894	3002.66	96.86	1035.4	89.9	1115.56	8.41	9381.86	9381.86
46	39.5	3	31	118.5	4680.75	355.5	3673.5	118.5	1224.5	93	1560.25	9	14042.25	14042.25
47	38.8	2.7	30	104.76	4064.688	282.852	3142.8	104.76	1164	81	1505.44	7.29	10974.66	10974.66
48	36.3	2.4	30	87.12	3162.456	209.088	2613.6	87.12	1089	72	1317.69	5.76	7589.894	7589.894
49	39.8	2.7	28	107.46	4276.908	290.142	3008.88	107.46	1114.4	75.6	1584.04	7.29	11547.65	11547.65
50	39.6	1.4	28	55.44	2195.424	77.616	1552.32	55.44	1108.8	39.2	1568.16	1.96	3073.594	3073.594
51	31.5	2.7	26	85.05	2679.075	229.635	2211.3	85.05	819	70.2	992.25	7.29	7233.503	7233.503

52	29.9	1.9	27	56.81	1698.619	107.939	1533.87	56.81	807.3	51.3	894.01	3.61	3227.376	3227.376
53	34.6	2.7	28	93.42	3232.332	252.234	2615.76	93.42	968.8	75.6	1197.16	7.29	8727.296	8727.296
54	36.8	2.7	30	99.36	3656.448	268.272	2980.8	99.36	1104	81	1354.24	7.29	9872.41	9872.41
55	33.4	2.9	31	96.86	3235.124	280.894	3002.66	96.86	1035.4	89.9	1115.56	8.41	9381.86	9381.86
56	36.9	2.7	31	99.63	3676.347	269.001	3088.53	99.63	1143.9	83.7	1361.61	7.29	9926.137	9926.137
57	37	3.1	28	114.7	4243.9	355.57	3211.6	114.7	1036	86.8	1369	9.61	13156.09	13156.09
58	33.8	3.2	30	108.16	3655.808	346.112	3244.8	108.16	1014	96	1142.44	10.24	11698.59	11698.59
59	32.8	2.8	29	91.84	3012.352	257.152	2663.36	91.84	951.2	81.2	1075.84	7.84	8434.586	8434.586
60	32.1	2.9	27	93.09	2988.189	269.961	2513.43	93.09	866.7	78.3	1030.41	8.41	8665.748	8665.748
61	36.3	2.3	28	83.49	3030.687	192.027	2337.72	83.49	1016.4	64.4	1317.69	5.29	6970.58	6970.58
62	39.4	1.8	28	70.92	2794.248	127.656	1985.76	70.92	1103.2	50.4	1552.36	3.24	5029.646	5029.646
63	40.2	2.1	30	84.42	3393.684	177.282	2532.6	84.42	1206	63	1616.04	4.41	7126.736	7126.736
64	38.5	2.7	30	103.95	4002.075	280.665	3118.5	103.95	1155	81	1482.25	7.29	10805.6	10805.6
65	33.4	2.9	31	96.86	3235.124	280.894	3002.66	96.86	1035.4	89.9	1115.56	8.41	9381.86	9381.86
66	36.7	3.3	30	121.11	4444.737	399.663	3633.3	121.11	1101	99	1346.89	10.89	14667.63	14667.63
67	33.1	3.1	29	102.61	3396.391	318.091	2975.69	102.61	959.9	89.9	1095.61	9.61	10528.81	10528.81
68	35.4	3	29	106.2	3759.48	318.6	3079.8	106.2	1026.6	87	1253.16	9	11278.44	11278.44
69	36	2.8	27	100.8	3628.8	282.24	2721.6	100.8	972	75.6	1296	7.84	10160.64	10160.64

70	34.8	2.2	27	76.56	2664.288	168.432	2067.12	76.56	939.6	59.4	1211.04	4.84	5861.434	5861.434
∑	**1041.9**	**96.5**	**2009**	**6068.08**	**95563.21**	**9281.668**	**175111.6**	**2657.22**	**30319.3**	**2811.4**	**37656.19**	**256.55**	**565658.4**	**565658.4**
	X_1	**X_2**	**X_3**	**Y**	**X_1Y**	**X_2Y**	**X_3Y**	**X_1X_2**	**X_1X_3**	**X_2X_3**	**X_1^2**	**X_2^2**	**X_3^2**	**Y^2**

Tabel 4. 2 Tabel Nilai Residual Variapel Penelitian

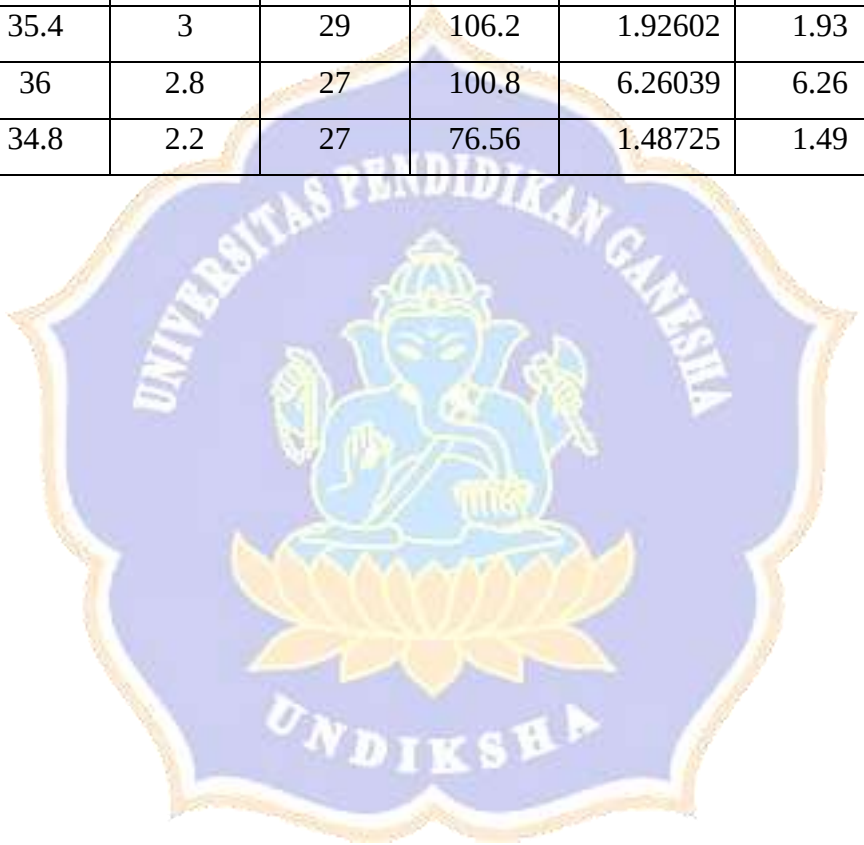
X_1	X_2	X_3	Y	Res_1	Res_2
34.2	1.6	29	54.72	-4.17323	-4.17
34.9	1.8	28	62.82	-0.93424	-0.93
35.5	2.2	29	46.15	-32.21271	-32.21
36.2	1.3	30	47.06	-3.80374	-3.8
40.9	1.4	33	57.26	-1.87357	-1.87
41.2	3.1	30	127.72	18.41899	18.42
39.8	2.8	29	111.44	13.52919	13.53
35.3	2.4	27	84.72	3.15568	3.16
34.9	1.9	26	66.31	2.58815	2.59
32.6	1.6	24	52.16	1.48775	1.49
32.2	4.3	31	138.46	-11.11181	-11.11

28.3	2.9	31	82.07	-22.05031	-22.05
28	3.7	29	103.6	-23.15471	-23.15
32.9	2.3	29	75.67	-5.86381	-5.86
35.2	1.9	27	66.88	1.51448	1.51
34.8	3.6	26	125.28	6.49376	6.49
34.1	3.2	29	109.12	-1.59838	-1.6
33.3	2.7	30	89.91	-6.22705	-6.23
28.4	1.9	28	53.96	-12.86314	-12.86
28	3	26	84	-15.17263	-15.17
32.4	1.2	25	38.88	-0.46588	-0.47
344	1.9	25	65.36	-4.82597	-4.83
32.9	2.3	27	75.67	-2.59219	-2.59
33.4	2.5	28	83.5	-2.88958	-2.89
38.3	1.2	30	45.96	-1.71954	-1.72
36.7	3	31	110.1	2.52034	2.52
34	3.1	30	105.4	-3.71234	-3.71
34.2	2.9	29	99.18	-1.8233	-1.82
33.5	2.2	27	73.7	-1.33868	-1.34

31.3	2.6	25	81.38	-3.28635	-3.29
40.9	1.4	29	57.26	4.66967	4.67
39.8	2.4	28	95.52	12.20195	12.2
37.5	1.9	30	71.25	0.91678	0.92
38.4	3.9	30	149.76	14.61848	14.62
37.2	2.3	28	85.56	5.54931	5.55
39.3	2	29	78.6	6.61618	6.62
38.1	3.1	30	118.11	8.89022	8.89
38.2	3	29	114.6	10.25265	10.25
39.3	2.4	29	94.32	9.37924	9.38
37	1.8	28	66.6	2.79073	2.79
33.8	1.8	28	60.84	-2.88541	-2.89
35.2	1.7	29	59.84	-2.31867	-2.32
40	1.7	30	68	4.07974	4.08
36.7	2	30	73.4	-0.1515	-0.15
33.4	2.9	31	96.86	-7.39395	-7.39
39.5	3	31	118.5	10.84696	10.85
38.8	2.7	30	104.76	8.47882	8.48

36.3	2.4	30	87.12	0.62204	0.62
39.8	2.7	28	107.46	14.42424	14.42
39.6	1.4	28	55.44	4.51954	4.52
31.5	2.7	26	85.05	-4.49664	-4.5
29.9	1.9	27	56.81	-8.41664	-8.42
34.6	2.7	28	93.42	0.5205	0.52
36.8	2.7	30	99.36	3.13123	3.13
33.4	2.9	31	96.86	-7.39395	-7.39
36.9	2.7	31	99.63	1.7628	1.76
37	3.1	28	114.7	8.78067	8.78
33.8	3.2	30	108.16	-4.18633	-4.19
32.8	2.8	29	91.84	-5.88737	-5.89
32.1	2.9	27	93.09	-4.58665	-4.59
36.3	2.3	28	83.49	3.5029	3.5
39.4	1.8	28	70.92	7.04784	7.05
40.2	2.1	30	84.42	7.53755	7.54
38.5	2.7	30	103.95	7.67668	7.68
33.4	2.9	31	96.86	-7.39395	-7.39

36.7	3.3	30	121.11	5.44844	5.45
33.1	3.1	29	102.61	-4.84294	-4.84
35.4	3	29	106.2	1.92602	1.93
36	2.8	27	100.8	6.26039	6.26
34.8	2.2	27	76.56	1.48725	1.49



RIWAYAT PENULIS

Ni Made Dwi Andayani lahir di Denpasar tahun 2001. Penulis merupakan anak kedua dari pasangan suami istri I Ketut Jesna dan Ni Nyoman Ratni. Saat ini, penulis tinggal di Jalan Raya Singapadu Br Kebon Singapadu. Penulis menyelesaikan pendidikan dasar di SD Negeri 1 Singapadu selama 6 tahun, pendidikan menengah pertama di SMP Negeri 1 Sukawati, dan pendidikan menengah atas di SMAN 1 Ubud. Penulis melanjutkan pendidikan S1 di Universitas Pendidikan Ganesha dengan program studi Pendidikan Fisika. Pada semster akhir tahun 2023 ini, penulis telah menyelesaikan skripsi yang berjudul "Pengembangan Rancang Bangun *Solar Monitoring System* Berbasis *Internet Of Things (IoT).* Selanjutnya dari tahun 2019 sampai dengan penulisan skripsi ini, penulis masih terdaftar sebagai mahasiswa Program Studi S1 Pendidikan Fisika, Universitas Pendidikan Ganesha.