Lampiran 1

Data Sheet

1.) *Photovoltaic* (Solar Panel)

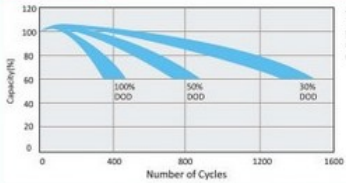
Model	: SP100-18P
Cell efficiency	: 16,93%
Max. power volt (Vmp)	: 17,8 Volt
Max. power current (Imp)	: 5,62 A
Open circuit volt (Voc)	: 21,8 Volt
Short Circuit Current (Isc)	: 6,05 A
Max system voltage	: 1000 V
Series fuse rating	: 12 A
Number of bypass diode	: 2
Operating temperature	: $-4^{O}C$ to $+35^{O}C$
Maximum system voltage	: 1000 VDC

STC Irrediance $1000W/m^2$
Module temperature $25\ ^{O}C$ AM-1,5

2.) Battery

Model	: SMT1240
Voltage	:12 Volt
Capacity	: 40 AH
Resistance	: ≤7,3 mΩ
Product Description	: 196 x 165 x 175 mm
Product weight / weight + box	: ±12 kg/±12,5 kg
Quantity per carton	: 1
Terminal size	: T11
Terminal Type	: 0

Life Chart



Testing Condition

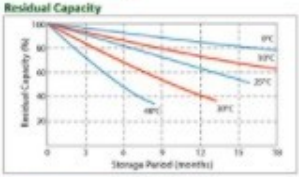
Discharging: current 0.17C (FV 1.7V/cell);
Charging: current 0.25C max, voltage 2.45V/cell;
Charging volume: 125% of discharged capacity.

SMT-POWER BATTERY

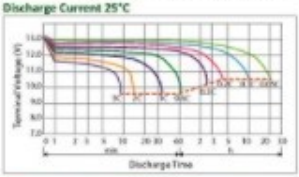
12 Volt Battery SMT1240

VALVE REGULATED LEAD ACID BATTERY

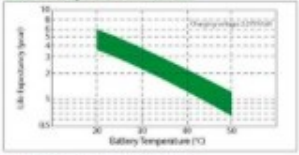
Residual Capacity



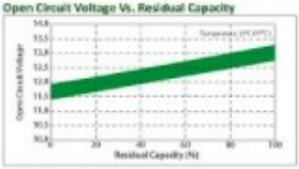
Discharge Current 25°C



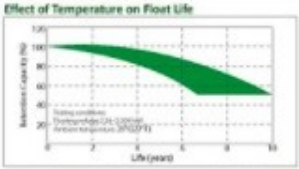
Effect of Temperature on Float Life



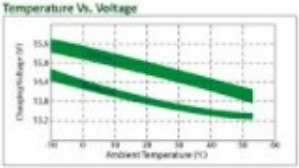
Open Circuit Voltage Vs. Residual Capacity



Effect of Temperature on Float Life



Temperature Vs. Voltage



Constant Current Discharge Characteristics (A, 25°C)

F.V/Time	5min	10min	15min	30min	60min	2h	3h	5h	8h	10h	20h
9.60V	120.2	80.0	62.8	40.0	23.9	13.9	9.8	7.0	4.6	4.0	2.1
10.2V	114.2	76.0	60.3	38.0	23.0	13.7	9.7	6.9	4.6	3.9	2.1
10.5V	110.7	73.6	58.8	37.0	22.4	13.6	9.6	6.8	4.6	3.8	2.1
10.8V	107.2	71.4	57.3	36.1	21.8	13.4	9.5	6.7	4.5	3.8	2.0

Constant Current Discharge Characteristics (Watt, 25°C)

F.V/Time	5min	10min	15min	30min	60min	2h	3h	5h	8h	10h	20h
9.60V	1259.5	863.7	689.4	440.9	275.5	160.5	116.2	82.3	55.0	46.2	24.3
10.2V	1196.4	820.6	662.3	426.9	262.5	158.2	114.2	81.0	54.5	45.7	24.1
10.5V	1160.3	796.1	645.6	415.8	256.0	157.0	113.2	80.2	54.2	45.5	24.0
10.8V	1124.2	771.5	629.3	404.8	249.5	155.2	112.2	79.4	53.7	45.3	23.9

Capacity Factors with Different Temperature

Battery Type	-20°C	-10°C	0°C	5°C	10°C	20°C	25°C	30°C	40°C	45°C
Battery	12V	50%	70%	85%	85%	90%	98%	100%	102%	104%	105%

The above are average and data obtained from the first 3 charge/discharge cycles. These are not minimum values.

Lampiran 2

Panel Blok 1

```
#include <Wire.h>
#include <Adafruit_INA219.h>
#include "DHT.h"

#define pinBatt1 A0
#define pinCurrent A1

#define pinRelayPanel1 A15
#define pinRelayPanel2 A14
#define pinRelayBatt1 A13
#define pinRelayBatt2 A12

#define pinRelayCam 2
#define pinRelayAerator 3
#define pinRelayPompa 4
#define pinRelayLed 5

#define DHTPIN 8
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

Adafruit_INA219 ina219;

String modeAerator, modePompa, modeLed;
String modeAerator2, modePompa2, modeLed2;
String valAerator, valPompa, valLed;
String valAerator2, valPompa2, valLed2;
String valParalelPanel1, valParalelPanel2;
String valParalelBaterai1, valParalelBaterai2;
String inputString3;

float percentageBatt2;
```

```
String voltPanel2,voltBatt2;
String currentPanel2,currentBatt2;
String inputString2;

bool flagParalelPanel2;
bool flagParalelBaterai1;

bool flagModeAerator = false;
bool flagAerator = true;
bool flagModePompa = false;
bool flagPompa = true;
bool flagModeLed = false;
bool flagLed = true;
int a;
int b;
int notifPanel;
int notifBaterai;

float lastCurent;

float voltRaw;
float voltBatt1;
float voltArr1[10];
float voltFilter1;
float percentageBatt1;
float SOC0 = 50;

float loadCurrent1;
float currentArr1[10];
float currentFilter1;

float mapFloat(float x, float in_min, float in_max, float out_min, float
out_max){
  return (x - in_min) * (out_max - out_min) / (in_max - in_min) + out_min;
}
```

```
void paralel_panel_on(){
  digitalWrite(pinRelayPanel1, LOW);
  digitalWrite(pinRelayPanel2, LOW);
}

void paralel_panel_off(){
  digitalWrite(pinRelayPanel1, HIGH);
  digitalWrite(pinRelayPanel2, HIGH);
}

void paralel_baterai2_on(){
  digitalWrite(pinRelayBatt1, LOW);
  digitalWrite(pinRelayBatt2, LOW);
}

void paralel_baterai2_off(){
  digitalWrite(pinRelayBatt1, HIGH);
  digitalWrite(pinRelayBatt2, HIGH);
}

void setup() {
  Serial.begin(9600);
  Serial2.begin(9600);
  Serial3.begin(9600);

  pinMode(pinBatt1, INPUT);
  pinMode(pinCurrent, INPUT);

  pinMode(pinRelayPanel1, OUTPUT);
  pinMode(pinRelayPanel2, OUTPUT);
  pinMode(pinRelayBatt1, OUTPUT);
  pinMode(pinRelayBatt2, OUTPUT);

  pinMode(pinRelayCam, OUTPUT);
```

```
  pinMode(pinRelayAerator, OUTPUT);
  pinMode(pinRelayPompa, OUTPUT);
  pinMode(pinRelayLed, OUTPUT);

  digitalWrite(pinRelayCam, LOW);
  digitalWrite(pinRelayAerator, HIGH);
  digitalWrite(pinRelayPompa, HIGH);
  digitalWrite(pinRelayLed, HIGH);

  paralel_panel_off();
  paralel_baterai2_off();

  while (!Serial) delay(1);

  uint32_t currentFrequency;
  ina219.begin();
  dht.begin();

}

void loop() {
//===========MENGAMBIL DATA DARI WEMOS============
  serialEvent3();
//=================================================

//==========MENGAMBIL DATA DARI PANEL 2===========
  serialEvent2();
//=================================================

//=========PENGUKURAN SUHU DAN KELEMBABAN=========
  float t = dht.readTemperature();
  float h = dht.readHumidity();
//=================================================

//=======PENGUKURAN TEGANGAN DAN ARUS PANEL=======
```

```
  float shuntvoltage  = 0;
  float busvoltage    = 0;
  float current_mA    = 0;
  float loadvoltage   = 0;

  shuntvoltage  = ina219.getShuntVoltage_mV();
  busvoltage    = ina219.getBusVoltage_V();
  current_mA    = ina219.getCurrent_mA();
  current_mA    = current_mA/1000;
  loadvoltage   = busvoltage + (shuntvoltage / 1000);

  if(current_mA < lastCurent - 1) current_mA = lastCurent;
  lastCurent = current_mA;
//==================================================

//==========PENGUKURAN TEGANGAN BATERAI===========
  //Tegangan baterai
  voltRaw     = analogRead(pinBatt1);
  voltBatt1   = (voltRaw*33) / 1023;
  voltArr1[a] = voltBatt1+0.8;
  voltFilter1 = voltArr1[0] + voltArr1[1] + voltArr1[2] + voltArr1[3] +
voltArr1[4] + voltArr1[5] + voltArr1[6] + voltArr1[7] + voltArr1[8] +
voltArr1[9];
  voltFilter1 = voltFilter1/10;

//  //Persentase baterai
//  percentageBatt1 = mapFloat(voltFilter1, 10, 13.5, 0, 100);
//  if(percentageBatt01 >= 100)    percentageBatt1 = 100;
//  else if(percentageBatt1 <= 0) percentageBatt1 = 0;
//==================================================

//============PENGUKURAN ARUS BATERAI=============
  unsigned int x=0;
  float AcsValue=0.0,Samples=0.0,AvgAcs=0.0,AcsValueF=0.0;
  for (int x = 0; x < 150; x++){ //Get 150 samples
```

```
    AcsValue = analogRead(A1);     //Read current sensor values
    Samples = Samples + AcsValue;  //Add samples together
    delay (3); // let ADC settle before next sample 3ms
  }
  AvgAcs=Samples/150.0;//Taking Average of Samples
  AcsValueF = (2.4159 + (AvgAcs * (5.0 / 1024.0)) )/0.185;

  currentArr1[a]  = AcsValueF;
  currentFilter1  = currentArr1[0] + currentArr1[1] + currentArr1[2] +
currentArr1[3] + currentArr1[4] + currentArr1[5] + currentArr1[6] +
currentArr1[7] + currentArr1[8] + currentArr1[9];
  currentFilter1  = currentFilter1/10;
  currentFilter1  = currentFilter1 -26.7;
  if(currentFilter1 <= 0) currentFilter1=0;

  //persentase baterai
  percentageBatt1 = SOC0 + (((current_mA - currentFilter1)/40)*100/3600);
  SOC0=percentageBatt1;
//=================================================

  if(percentageBatt2 <= 30 && percentageBatt1 <= 30){ //kedua baterai
kurang dari 30
    notifBaterai = 3;
  }
  else if(percentageBatt2 <= 50){                    //baterai 2 kurang dari 50
    notifBaterai = 2;
  }
  else if(percentageBatt1 <= 50){                    //baterai 1 kurang dari atau
sama dengan 50
    notifBaterai = 1;
  }
  else{                                  //kedua baterai lebih dari 50
    notifBaterai = 0;
  }
```

```
  if(percentageBatt1 == 100 && percentageBatt2 < 60 && percentageBatt2
> 30){      //baterai 2 diantara 30%-60% dan baterai 1 100%
    notifPanel = 1;                                          // notif panel
paralel ke baterai 2
  }
  else if(percentageBatt1 < 60 && percentageBatt1 > 30 &&
percentageBatt2 == 100){  //baterai 1 diantara 30%-60% dan baterai 2
100%
    notifPanel = 2;                                          //notif panel
paralel ke baterai 1
  }
  else{
    notifPanel = 0;
  }


//=================KONTROL BLYNK=================
  //KONTROL AERATOR===================
  //aerator manual
  if(modeAerator == "0"){
    flagModeAerator = false;
    if(valAerator == "1")       {digitalWrite(pinRelayAerator, LOW);}
    else if(valAerator == "0")  {digitalWrite(pinRelayAerator, HIGH);}
  }
  else if(modeAerator == "1") {flagModeAerator = true;}

  //aerator auto
  if(flagModeAerator){
    if(percentageBatt2 <= 30){                //mode low power, baterai
dibawah atau sama dengan 30%
      digitalWrite(pinRelayAerator, HIGH);       //aerator mati
    }
    else if(percentageBatt2 <= 50){             //mode eco, baterai dibawah
atau sama dengan 50%
      digitalWrite(pinRelayAerator, flagAerator); //aerator durasi 30menit
```

```
    }
    else{                                   //mode normal, baterai diatas 50%
      digitalWrite(pinRelayAerator, LOW);        //aerator aktif
    }
  }

  //KONTROL POMPA====================
  //pompa manual
  if(modePompa == "0"){
    flagModePompa = false;
    if(valPompa == "1")        {digitalWrite(pinRelayPompa, LOW);}
    else if(valPompa == "0")    {digitalWrite(pinRelayPompa, HIGH);}
  }
  else if(modePompa == "1"){flagModePompa = true;}

  //pompa auto
  if(flagModePompa){
    if(percentageBatt1 > 50) {                  //mode normal, baterai diatas 50%
      digitalWrite(pinRelayPompa, flagPompa);     //pompa durasi 30menit
    }
    else {digitalWrite(pinRelayPompa, HIGH);}     //mode low power,
pompa mati
  }

  //KONTROL LED======================
  //led manual
  if(modeLed == "0"){
    flagModeLed = false;
    if(valLed == "1")          {digitalWrite(pinRelayLed, LOW);}
    else if(valLed == "0")      {digitalWrite(pinRelayLed, HIGH);}
  }
  else if(modeLed == "1"){flagModeLed = true;}

  //led auto
  if(flagModeLed){
```

```
    if(percentageBatt1 > 50) {                    //mode normal, baterai diatas
50%
      digitalWrite(pinRelayLed, LOW);             //led nyala
    }
    else {                                        //mode low power, baterai dibawah atau
sama dengan 50%
      digitalWrite(pinRelayLed, HIGH);            //led mati
    }
  }

  if(valParalelPanel1 == "0")        {paralel_panel_off();}
  else if(valParalelPanel1 == "1")    {paralel_panel_on() ;}

  if(valParalelBaterai2 == "0")       {paralel_baterai2_off();}
  else if(valParalelBaterai2 == "1")  {paralel_baterai2_on();}

  if(valParalelPanel2 == "0")        {flagParalelPanel2 = false;}
  else if(valParalelPanel2 == "1")    {flagParalelPanel2 = true;}

  if(valParalelBaterai1 == "0")       {flagParalelBaterai1 = false;}
  else if(valParalelBaterai1 == "1")  {flagParalelBaterai1 = true;}
//==================================================

//===================SEND DATA====================
  String send_data = "A" + String(modeAerator2) + "B" +
String(modePompa2) + "C" + String(modeLed2) + "D" +
String(valAerator2) + "E" + String(valPompa2) + "F" + String(valLed2) +
"G" + String(flagParalelPanel2) + "H" + String(flagParalelBaterai1) + "I";
  send_data = send_data + (send_data.length()) + "J";
  Serial2.println(send_data);

  String send_wemos = "A" + String(loadvoltage) + "B" +
String(current_mA) + "C" + String(percentageBatt1) + "D" +
String(voltFilter1) + "E" + String(currentFilter1) + "F" + String(voltPanel2)
+ "G" + String(currentPanel2) + "H" + String(percentageBatt2) + "I" +
```

```
String(voltBatt2) + "J" + String(currentBatt2) + "K" + String(notifPanel) +
"L" + String(notifBaterai) + "M" + String(t) + "N" + String(h) + "O";
  //String send_wemos = "A" + String(14) + "B" + String(1020) + "C" +
String(80) + "D" + String(12.9) + "E" + String(1.8) + "F" + String(14) +
"G" + String(3245) + "H" + String(70) + "I" + String(12.3) + "J" +
String(2.21) + "K" + String(1) + "L" + String(0) + "M" + String(t) + "N" +
String(h) + "O";
  send_wemos = send_wemos + (send_wemos.length()) + "P";
  Serial3.println(send_wemos);
//==================================================

//  paralel_baterai2_on();
//  digitalWrite(pinRelayAerator, LOW);

  Serial.print("I1: "); Serial.print(currentFilter1);
  Serial.print(" I2: "); Serial.println(currentBatt2);

  delay(550);
  a++;
  if(a > 9) a = 0;

  b++;
  if(b >= 1800){
    flagAerator = !flagAerator;
    flagPompa = !flagPompa;
    b=0;
  }
}
```

Parsing Blok 1 ke Blok 2

```
void serialEvent2(){
  while (Serial2.available()) {
    //Serial.println(inputString2);
    char inChar = (char)Serial2.read();
    inputString2 += inChar;
```

```
    if (inChar == 'G') {
      int a = inputString2.indexOf('A');
      int b = inputString2.indexOf('B');
      int c = inputString2.indexOf('C');
      int d = inputString2.indexOf('D');
      int e = inputString2.indexOf('E');
      int f = inputString2.indexOf('F');
      int g = inputString2.indexOf('G');
      int fcs = inputString2.substring(f+1,g).toInt();
      int jml_data =  inputString2.substring(a,f+1).length();

      if (fcs == jml_data){
        //Serial.println(inputString2);
        voltPanel2      = inputString2.substring(a+1,b);
        voltBatt2       = inputString2.substring(b+1,c);
        percentageBatt2 = inputString2.substring(c+1,d).toFloat();
        currentPanel2   = inputString2.substring(d+1,e);
        currentBatt2    = inputString2.substring(e+1,f);
      }
      inputString2="";
    }
  }
}
```

Parsing Blok 1 ke Wemos D1

```
void serialEvent3(){
  while (Serial3.available()) {
    //Serial.println(inputString3);
    char inChar = (char)Serial3.read();
    inputString3 += inChar;
    if (inChar == 'R') {
      int a = inputString3.indexOf('A');
      int b = inputString3.indexOf('B');
      int c = inputString3.indexOf('C');
      int d = inputString3.indexOf('D');
```

```
int e = inputString3.indexOf('E');
int f = inputString3.indexOf('F');
int g = inputString3.indexOf('G');
int h = inputString3.indexOf('H');
int i = inputString3.indexOf('I');
int j = inputString3.indexOf('J');
int k = inputString3.indexOf('K');
int l = inputString3.indexOf('L');
int m = inputString3.indexOf('M');
int n = inputString3.indexOf('N');
int o = inputString3.indexOf('O');
int p = inputString3.indexOf('P');
int q = inputString3.indexOf('Q');
int r = inputString3.indexOf('R');
int fcs = inputString3.substring(q+1,r).toInt();
int jml_data =  inputString3.substring(a,q+1).length();

if (fcs == jml_data){
  //Serial.println(inputString3);
  modeAerator        = inputString3.substring(a+1,b);
  modePompa          = inputString3.substring(b+1,c);
  modeLed            = inputString3.substring(c+1,d);
  modeAerator2       = inputString3.substring(d+1,e);
  modePompa2         = inputString3.substring(e+1,f);
  modeLed2           = inputString3.substring(f+1,g);
  valAerator         = inputString3.substring(g+1,h);
  valPompa           = inputString3.substring(h+1,i);
  valLed             = inputString3.substring(i+1,j);
  valAerator2        = inputString3.substring(j+1,k);
  valPompa2          = inputString3.substring(k+1,l);
  valLed2            = inputString3.substring(l+1,m);
  valParalelPanel1   = inputString3.substring(m+1,n);
  valParalelPanel2   = inputString3.substring(n+1,o);
  valParalelBaterai1 = inputString3.substring(o+1,p);
  valParalelBaterai2 = inputString3.substring(p+1,q);
```

```
      }
      inputString3="";
    }
  }
}
```

Arduino mega 2560 Blok 2

```
#include <Wire.h>
#include <Adafruit_INA219.h>
#include "DHT.h"

#define pinBatt1 A0
#define pinCurrent A1

#define pinRelayPanel1 A15
#define pinRelayPanel2 A14
#define pinRelayBatt1 A13
#define pinRelayBatt2 A12

#define pinRelayCam 2
#define pinRelayAerator 3
#define pinRelayPompa 4
#define pinRelayLed 5

#define DHTPIN 8
#define DHTTYPE DHT11
DHT dht(DHTPIN, DHTTYPE);

Adafruit_INA219 ina219;

String modeAerator, modePompa, modeLed;
String modeAerator2, modePompa2, modeLed2;
String valAerator, valPompa, valLed;
String valAerator2, valPompa2, valLed2;
```

```
String valParalelPanel1, valParalelPanel2;
String valParalelBaterai1, valParalelBaterai2;
String inputString3;

float percentageBatt2;
String voltPanel2,voltBatt2;
String currentPanel2,currentBatt2;
String inputString2;

bool flagParalelPanel2;
bool flagParalelBaterai1;

bool flagModeAerator = false;
bool flagAerator = true;
bool flagModePompa = false;
bool flagPompa = true;
bool flagModeLed = false;
bool flagLed = true;
int a;
int b;
int notifPanel;
int notifBaterai;

float lastCurent;

float voltRaw;
float voltBatt1;
float voltArr1[10];
float voltFilter1;
float percentageBatt1;
float SOC0 = 50;

float loadCurrent1;
float currentArr1[10];
float currentFilter1;
```

```
float mapFloat(float x, float in_min, float in_max, float out_min, float
out_max){
  return (x - in_min) * (out_max - out_min) / (in_max - in_min) + out_min;
}

void paralel_panel_on(){
  digitalWrite(pinRelayPanel1, LOW);
  digitalWrite(pinRelayPanel2, LOW);
}

void paralel_panel_off(){
  digitalWrite(pinRelayPanel1, HIGH);
  digitalWrite(pinRelayPanel2, HIGH);
}

void paralel_baterai2_on(){
  digitalWrite(pinRelayBatt1, LOW);
  digitalWrite(pinRelayBatt2, LOW);
}

void paralel_baterai2_off(){
  digitalWrite(pinRelayBatt1, HIGH);
  digitalWrite(pinRelayBatt2, HIGH);
}

void setup() {
  Serial.begin(9600);
  Serial2.begin(9600);
  Serial3.begin(9600);

  pinMode(pinBatt1, INPUT);
  pinMode(pinCurrent, INPUT);

  pinMode(pinRelayPanel1, OUTPUT);
```

```
  pinMode(pinRelayPanel2, OUTPUT);
  pinMode(pinRelayBatt1, OUTPUT);
  pinMode(pinRelayBatt2, OUTPUT);

  pinMode(pinRelayCam, OUTPUT);
  pinMode(pinRelayAerator, OUTPUT);
  pinMode(pinRelayPompa, OUTPUT);
  pinMode(pinRelayLed, OUTPUT);

  digitalWrite(pinRelayCam, LOW);
  digitalWrite(pinRelayAerator, HIGH);
  digitalWrite(pinRelayPompa, HIGH);
  digitalWrite(pinRelayLed, HIGH);

  paralel_panel_off();
  paralel_baterai2_off();

  while (!Serial) delay(1);

  uint32_t currentFrequency;
  ina219.begin();
  dht.begin();

}

void loop() {
//===========MENGAMBIL DATA DARI WEMOS============
  serialEvent3();
//=================================================

//==========MENGAMBIL DATA DARI PANEL 2===========
  serialEvent2();
//=================================================

//=========PENGUKURAN SUHU DAN KELEMBABAN=========
```

```
  float t = dht.readTemperature();
  float h = dht.readHumidity();
//==================================================

//=======PENGUKURAN TEGANGAN DAN ARUS PANEL=======
  float shuntvoltage  = 0;
  float busvoltage    = 0;
  float current_mA    = 0;
  float loadvoltage   = 0;

  shuntvoltage  = ina219.getShuntVoltage_mV();
  busvoltage    = ina219.getBusVoltage_V();
  current_mA    = ina219.getCurrent_mA();
  current_mA    = current_mA/1000;
  loadvoltage   = busvoltage + (shuntvoltage / 1000);

  if(current_mA < lastCurent - 1) current_mA = lastCurent;
  lastCurent = current_mA;
//==================================================

//==========PENGUKURAN TEGANGAN BATERAI===========
  //Tegangan baterai
  voltRaw     = analogRead(pinBatt1);
  voltBatt1   = (voltRaw*33) / 1023;
  voltArr1[a] = voltBatt1+0.8;
  voltFilter1 = voltArr1[0] + voltArr1[1] + voltArr1[2] + voltArr1[3] +
voltArr1[4] + voltArr1[5] + voltArr1[6] + voltArr1[7] + voltArr1[8] +
voltArr1[9];
  voltFilter1 = voltFilter1/10;

//  //Persentase baterai
//  percentageBatt1 = mapFloat(voltFilter1, 10, 13.5, 0, 100);
//  if(percentageBatt01 >= 100)    percentageBatt1 = 100;
//  else if(percentageBatt1 <= 0) percentageBatt1 = 0;
//==================================================
```

```
//============PENGUKURAN ARUS BATERAI=============
  unsigned int x=0;
  float AcsValue=0.0,Samples=0.0,AvgAcs=0.0,AcsValueF=0.0;
  for (int x = 0; x < 150; x++){ //Get 150 samples
    AcsValue = analogRead(A1);     //Read current sensor values
    Samples = Samples + AcsValue;  //Add samples together
    delay (3); // let ADC settle before next sample 3ms
  }
  AvgAcs=Samples/150.0;//Taking Average of Samples
  AcsValueF = (2.4159 + (AvgAcs * (5.0 / 1024.0)) )/0.185;

  currentArr1[a]  = AcsValueF;
  currentFilter1  = currentArr1[0] + currentArr1[1] + currentArr1[2] +
currentArr1[3] + currentArr1[4] + currentArr1[5] + currentArr1[6] +
currentArr1[7] + currentArr1[8] + currentArr1[9];
  currentFilter1  = currentFilter1/10;
  currentFilter1  = currentFilter1 -26.7;
  if(currentFilter1 <= 0) currentFilter1=0;

  //persentase baterai
  percentageBatt1 = SOC0 + (((current_mA - currentFilter1)/40)*100/3600);
  SOC0=percentageBatt1;
//==============================================

  if(percentageBatt2 <= 30 && percentageBatt1 <= 30){ //kedua baterai
kurang dari 30
    notifBaterai = 3;
  }
  else if(percentageBatt2 <= 50){                  //baterai 2 kurang dari 50
    notifBaterai = 2;
  }
  else if(percentageBatt1 <= 50){                  //baterai 1 kurang dari atau
sama dengan 50
    notifBaterai = 1;
```

```
  }
  else{                                   //kedua baterai lebih dari 50
    notifBaterai = 0;
  }

  if(percentageBatt1 == 100 && percentageBatt2 < 60 && percentageBatt2
> 30){       //baterai 2 diantara 30%-60% dan baterai 1 100%
    notifPanel = 1;                                          // notif panel
paralel ke baterai 2
  }
  else if(percentageBatt1 < 60 && percentageBatt1 > 30 &&
percentageBatt2 == 100){  //baterai 1 diantara 30%-60% dan baterai 2
100%
    notifPanel = 2;                                          //notif panel
paralel ke baterai 1
  }
  else{
    notifPanel = 0;
  }


//=================KONTROL BLYNK==================
  //KONTROL AERATOR====================
  //aerator manual
  if(modeAerator == "0"){
    flagModeAerator = false;
    if(valAerator == "1")       {digitalWrite(pinRelayAerator, LOW);}
    else if(valAerator == "0")  {digitalWrite(pinRelayAerator, HIGH);}
  }
  else if(modeAerator == "1") {flagModeAerator = true;}

  //aerator auto
  if(flagModeAerator){
    if(percentageBatt2 <= 30){                  //mode low power, baterai
dibawah atau sama dengan 30%
```

```
    digitalWrite(pinRelayAerator, HIGH);        //aerator mati
  }
  else if(percentageBatt2 <= 50){              //mode eco, baterai dibawah
atau sama dengan 50%
    digitalWrite(pinRelayAerator, flagAerator); //aerator durasi 30menit
  }
  else{                                        //mode normal, baterai diatas 50%
    digitalWrite(pinRelayAerator, LOW);         //aerator aktif
  }
}

//KONTROL POMPA====================
//pompa manual
if(modePompa == "0"){
  flagModePompa = false;
  if(valPompa == "1")        {digitalWrite(pinRelayPompa, LOW);}
  else if(valPompa == "0")    {digitalWrite(pinRelayPompa, HIGH);}
}
else if(modePompa == "1"){flagModePompa = true;}

//pompa auto
if(flagModePompa){
  if(percentageBatt1 > 50) {                   //mode normal, baterai diatas 50%
    digitalWrite(pinRelayPompa, flagPompa);     //pompa durasi 30menit
  }
  else {digitalWrite(pinRelayPompa, HIGH);}     //mode low power,
pompa mati
}

//KONTROL LED======================
//led manual
if(modeLed == "0"){
  flagModeLed = false;
  if(valLed == "1")          {digitalWrite(pinRelayLed, LOW);}
  else if(valLed == "0")      {digitalWrite(pinRelayLed, HIGH);}
```

```
  }
  else if(modeLed == "1"){flagModeLed = true;}

  //led auto
  if(flagModeLed){
    if(percentageBatt1 > 50) {                    //mode normal, baterai diatas
50%
      digitalWrite(pinRelayLed, LOW);             //led nyala
    }
    else {                                  //mode low power, baterai dibawah atau
sama dengan 50%
      digitalWrite(pinRelayLed, HIGH);            //led mati
    }
  }

  if(valParalelPanel1 == "0")         {paralel_panel_off();}
  else if(valParalelPanel1 == "1")    {paralel_panel_on() ;}

  if(valParalelBaterai2 == "0")       {paralel_baterai2_off();}
  else if(valParalelBaterai2 == "1")  {paralel_baterai2_on();}

  if(valParalelPanel2 == "0")         {flagParalelPanel2 = false;}
  else if(valParalelPanel2 == "1")    {flagParalelPanel2 = true;}

  if(valParalelBaterai1 == "0")       {flagParalelBaterai1 = false;}
  else if(valParalelBaterai1 == "1")  {flagParalelBaterai1 = true;}
//==================================================

//====================SEND DATA====================
  String send_data = "A" + String(modeAerator2) + "B" +
String(modePompa2) + "C" + String(modeLed2) + "D" +
String(valAerator2) + "E" + String(valPompa2) + "F" + String(valLed2) +
"G" + String(flagParalelPanel2) + "H" + String(flagParalelBaterai1) + "I";
  send_data = send_data + (send_data.length()) + "J";
  Serial2.println(send_data);
```

```
  String send_wemos = "A" + String(loadvoltage) + "B" +
String(current_mA) + "C" + String(percentageBatt1) + "D" +
String(voltFilter1) + "E" + String(currentFilter1) + "F" + String(voltPanel2)
+ "G" + String(currentPanel2) + "H" + String(percentageBatt2) + "I" +
String(voltBatt2) + "J" + String(currentBatt2) + "K" + String(notifPanel) +
"L" + String(notifBaterai) + "M" + String(t) + "N" + String(h) + "O";
  //String send_wemos = "A" + String(14) + "B" + String(1020) + "C" +
String(80) + "D" + String(12.9) + "E" + String(1.8) + "F" + String(14) +
"G" + String(3245) + "H" + String(70) + "I" + String(12.3) + "J" +
String(2.21) + "K" + String(1) + "L" + String(0) + "M" + String(t) + "N" +
String(h) + "O";
  send_wemos = send_wemos + (send_wemos.length()) + "P";
  Serial3.println(send_wemos);
//=================================================

//  paralel_baterai2_on();
//  digitalWrite(pinRelayAerator, LOW);

  Serial.print("I1: "); Serial.print(currentFilter1);
  Serial.print(" I2: "); Serial.println(currentBatt2);

  delay(550);
  a++;
  if(a > 9) a = 0;

  b++;
  if(b >= 1800){
    flagAerator = !flagAerator;
    flagPompa = !flagPompa;
    b=0;
  }
}
```

Parsing Blok 2 ke Blok 1

```
#include <Wire.h>
#include <Adafruit_INA219.h>

#define pinBatt2 A0
#define pinCurrent2 A1

#define pinRelayPanel1 A15
#define pinRelayPanel2 A14
#define pinRelayBatt1 A13
#define pinRelayBatt2 A12

#define pinRelayCam 2
#define pinRelayAerator 3
#define pinRelayPompa 4
#define pinRelayLed 5

Adafruit_INA219 ina219;

String modeAerator2, modePompa2, modeLed2;
String valAerator2, valPompa2, valLed2;
String flagParalelPanel2, flagParalelBaterai1;
String inputString3;

bool flagModeAerator = false;
bool flagAerator = false ;
bool flagModePompa = false;
bool flagPompa = true;
bool flagModeLed = false;
bool flagLed = true;
int a;
int b;

float lastCurent;
```

```
float voltRaw;
float voltBatt2;
float voltArr2[10];
float voltFilter2;
float percentageBatt2;
float SOC0 = 57;

float loadCurrent2;
float currentArr2[10];
float currentFilter2;

float mapFloat(float x, float in_min, float in_max, float out_min, float
out_max) {
  return (x - in_min) * (out_max - out_min) / (in_max - in_min) + out_min;
}

void paralel_panel_on() {
  digitalWrite(pinRelayPanel1, LOW);
  digitalWrite(pinRelayPanel2, LOW);
}

void paralel_panel_off() {
  digitalWrite(pinRelayPanel1, HIGH);
  digitalWrite(pinRelayPanel2, HIGH);
}

void paralel_baterai1_on() {
  digitalWrite(pinRelayBatt1, LOW);
  digitalWrite(pinRelayBatt2, LOW);
}

void paralel_baterai1_off() {
  digitalWrite(pinRelayBatt1, HIGH);
  digitalWrite(pinRelayBatt2, HIGH);
}
```

```
void setup() {
  Serial.begin(9600);
  Serial3.begin(9600);

  pinMode(pinBatt2, INPUT);
  pinMode(pinCurrent2, INPUT);

  pinMode(pinRelayPanel1, OUTPUT);
  pinMode(pinRelayPanel2, OUTPUT);
  pinMode(pinRelayBatt1, OUTPUT);
  pinMode(pinRelayBatt2, OUTPUT);

  pinMode(pinRelayCam, OUTPUT);
  pinMode(pinRelayAerator, OUTPUT);
  pinMode(pinRelayPompa, OUTPUT);
  pinMode(pinRelayLed, OUTPUT);

  digitalWrite(pinRelayCam, LOW);
  digitalWrite(pinRelayAerator, HIGH);
  digitalWrite(pinRelayPompa, HIGH);
  digitalWrite(pinRelayLed, HIGH);

  paralel_panel_off();
  paralel_baterai1_off();

  //while (!Serial) delay(1);

  uint32_t currentFrequency;
  ina219.begin();

}

void loop() {
//==========MENGAMBIL DATA DARI PANEL 1===========
```

```
  serialEvent();
//==================================================

//=======PENGUKURAN TEGANGAN DAN ARUS PANEL=======
  float shuntvoltage  = 0;
  float busvoltage    = 0;
  float current_mA    = 0;
  float loadvoltage   = 0;

  shuntvoltage  = ina219.getShuntVoltage_mV();
  busvoltage    = ina219.getBusVoltage_V();
  current_mA    = ina219.getCurrent_mA();
  current_mA    = current_mA/1000;
  loadvoltage   = busvoltage + (shuntvoltage / 1000);

  if(current_mA < lastCurent - 1) current_mA = lastCurent;
  lastCurent = current_mA;
//==================================================

//==========PENGUKURAN TEGANGAN BATERAI===========
  //Tegangan baterai
  voltRaw     = analogRead(pinBatt2);
  voltBatt2   = (voltRaw*33) / 1023;
  voltArr2[a] = voltBatt2+0.8;
  voltFilter2 = voltArr2[0] + voltArr2[1] + voltArr2[2] + voltArr2[3] +
voltArr2[4] + voltArr2[5] + voltArr2[6] + voltArr2[7] + voltArr2[8] +
voltArr2[9];
  voltFilter2 = voltFilter2/10;

//  //Persentase baterai
//  percentageBatt2 = mapFloat(voltFilter2, 10, 13.5, 0, 100);
//  if(percentageBatt2 >= 100)    percentageBatt2 = 100;
//  else if(percentageBatt2 <= 0) percentageBatt2 = 0;
//==================================================
```

```
//============PENGUKURAN ARUS BATERAI=============
  unsigned int x=0;
  float AcsValue=0.0,Samples=0.0,AvgAcs=0.0,AcsValueF=0.0;
  for (int x = 0; x < 150; x++){ //Get 150 samples
    AcsValue = analogRead(A1);     //Read current sensor values
    Samples = Samples + AcsValue;  //Add samples together
    delay (3); // let ADC settle before next sample 3ms
  }
  AvgAcs=Samples/150.0;//Taking Average of Samples
  AcsValueF = (2.62 - (AvgAcs * (5.0 / 1024.0)) )/0.185;

  currentArr2[a]  = AcsValueF;
  currentFilter2  = currentArr2[0] + currentArr2[1] + currentArr2[2] +
currentArr2[3] + currentArr2[4] + currentArr2[5] + currentArr2[6] +
currentArr2[7] + currentArr2[8] + currentArr2[9];
  currentFilter2  = currentFilter2/10;
  currentFilter2 = currentFilter2 * 2;
  if(currentFilter2 <= 0) currentFilter2=0;

  //persentase baterai
  percentageBatt2 = SOC0 + (((current_mA - currentFilter2)/40)*100/3600);
  SOC0=percentageBatt2;
//==================================================

//=================KONTROL BLYNK==================
  //KONTROL AERATOR===================
  //modeAerator2="1";
  if(modeAerator2 == "0"){
    flagModeAerator = false;
    if(valAerator2 == "1")       {digitalWrite(pinRelayAerator, LOW);}
    else if(valAerator2 == "0")  {digitalWrite(pinRelayAerator, HIGH);}
  }
  else if(modeAerator2 == "1") {flagModeAerator = true;}

  if(flagModeAerator){
```

```
    if(percentageBatt2 <= 30){
      digitalWrite(pinRelayAerator, HIGH);
    }
    else if(percentageBatt2 <= 50){
      digitalWrite(pinRelayAerator, flagAerator);
    }
    else{
      digitalWrite(pinRelayAerator, LOW);
    }
  }
// digitalWrite(pinRelayAerator, LOW);

  //KONTROL POMPA====================
  if(modePompa2 == "0"){
    flagModePompa = false;
    if(valPompa2 == "1")        {digitalWrite(pinRelayPompa, LOW);}
    else if(valPompa2 == "0")    {digitalWrite(pinRelayPompa, HIGH);}
  }
  else if(modePompa2 == "1"){flagModePompa = true;}

  if(flagModePompa){
    if(percentageBatt2 > 50) {digitalWrite(pinRelayPompa, flagPompa);}
    else {digitalWrite(pinRelayPompa, HIGH);}
  }

  //KONTROL LED======================
  if(modeLed2 == "0"){
    flagModeLed = false;
    if(valLed2 == "1")          {digitalWrite(pinRelayLed, LOW);}
    else if(valLed2 == "0")      {digitalWrite(pinRelayLed, HIGH);}
  }
  else if(modeLed2 == "1"){flagModeLed = true;}

  if(flagModeLed){
    if(percentageBatt2 > 50) {digitalWrite(pinRelayLed, LOW);}
```

```
    else {digitalWrite(pinRelayLed, HIGH);}
  }
//digitalWrite(pinRelayLed, LOW);


  if(flagParalelPanel2 == "0")         {paralel_panel_off();}
  else if(flagParalelPanel2 == "1")    {paralel_panel_on() ;}

  if(flagParalelBaterai1 == "0")       {paralel_baterai1_off();}
  else if(flagParalelBaterai1 == "1")  {paralel_baterai1_on();}
//==================================================

//==================SEND DATA====================
  String send_data = "A" + String(loadvoltage) + "B" + String(voltFilter2) +
"C" + String(percentageBatt2) + "D" + String(current_mA) + "E" +
String(currentFilter2) + "F";
//  String send_data = "A" + String(14.1) + "B" + String(13.1) + "C" +
String(90) + "D" + String(1.24) + "E" + String(1.8) + "F";
  send_data = send_data + (send_data.length()) + "G";
  Serial.println(send_data);
//==================================================

  delay(550);
  a++;
  if(a > 9) {a = 0;}

  b++;
  if(b >= 1800){
    flagAerator = !flagAerator;
    flagPompa = !flagPompa;
    b=0;
  }
}
```

Wemos D1 (IoT)

```
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
#include <SimpleTimer.h>

#define led_on digitalWrite(2,LOW)
#define led_off digitalWrite(2,HIGH)

char auth[] = "J0T6PPYuBLQaD8zZkGUlN9iAGU1eq1B7"; //Enter the
Auth code which was send by Blink
char ssid[] = "Wifi_Kolam";  //Enter your WIFI Name
char pass[] = "999999999";  //Enter your WIFI Password

SimpleTimer timer;

int modeAerator1, modePompa1, modeLed1;
int modeAerator2, modePompa2, modeLed2;
int valAerator1, valPompa1, valLed1;
int valAerator2, valPompa2, valLed2;

String voltSolar1, ampSolar1;
String voltSolar2, ampSolar2;
String voltBatt1, percentBatt1, ampBatt1;
String voltBatt2, percentBatt2, ampBatt2;
String inputString;
int ran1,ran2;

void sendSensor(){
  serialEvent();

  Serial.print("voltSlr: "); Serial.print(voltSolar1);
  Serial.print(" ampSlr: "); Serial.print(ampSolar1);
  Serial.print(" voltBat: "); Serial.println(voltBatt1);

  Blynk.virtualWrite(V0, voltSolar1);
```

```
  Blynk.virtualWrite(V1, ampSolar1);
  Blynk.virtualWrite(V2, voltBatt1);
  Blynk.virtualWrite(V3, ampBatt1);
  Blynk.virtualWrite(V4, percentBatt1);

  Blynk.virtualWrite(V5, voltSolar2);
  Blynk.virtualWrite(V6, ampSolar2);
  Blynk.virtualWrite(V7, voltBatt2);
  Blynk.virtualWrite(V8, ampBatt2);
  Blynk.virtualWrite(V9, percentBatt2);


  String dataSend = "A" + String(modeAerator1) + "B" +
String(modePompa1) + "C" + String(modeLed1) + "D" +
String(modeAerator2) + "E" + String(modePompa2) + "F" +
String(modeLed2) + "G" + String(valAerator1) + "H" + String(valPompa1)
+ "I" + String(valLed1) + "J" + String(valAerator2) + "K" +
String(valPompa2) + "L" + String(valLed2) + "M";
  dataSend = dataSend + String(dataSend.length()) + "N";
  Serial.println(dataSend);
}

BLYNK_WRITE(V15){
  modeAerator1 = param.asInt();
}
BLYNK_WRITE(V17){
  modePompa1 = param.asInt();
}
BLYNK_WRITE(V19){
  modeLed1 = param.asInt();
}
BLYNK_WRITE(V16){
  valAerator1 = param.asInt();
}
BLYNK_WRITE(V18){
```

```
  valPompa1 = param.asInt();
}
BLYNK_WRITE(V20){
  valLed1 = param.asInt();
}

BLYNK_WRITE(V21){
  modeAerator2 = param.asInt();
}
BLYNK_WRITE(V23){
  modePompa2 = param.asInt();
}
BLYNK_WRITE(V25){
  modeLed2 = param.asInt();
}
BLYNK_WRITE(V22){
  valAerator2 = param.asInt();
}
BLYNK_WRITE(V24){
  valPompa2 = param.asInt();
}
BLYNK_WRITE(V26){
  valLed2 = param.asInt();
}

void setup() {
  Serial.begin(9600);
  pinMode(2, OUTPUT);

  Serial.print("Connecting to ");
  Serial.println(ssid);

  WiFi.mode(WIFI_STA);
  WiFi.begin(ssid, pass);
  led_off;
```

```
  while (WiFi.status() != WL_CONNECTED) {
    delay(500);
    //Serial.print(".");
  }
  led_on;

  Blynk.begin(auth, ssid, pass);
  timer.setInterval(1000L, sendSensor);
}

void loop() {
  Blynk.run(); // Initiates Blynk
  timer.run(); // Initiates SimpleTimer
}
```

Parsing Wemos D1

```
void serialEvent(){
  while (Serial.available()) {
//    Serial.println(inputString);
    char inChar = (char)Serial.read();
    inputString += inChar;
    if (inChar == 'L') {
      int a = inputString.indexOf('A');
      int b = inputString.indexOf('B');
      int c = inputString.indexOf('C');
      int d = inputString.indexOf('D');
      int e = inputString.indexOf('E');
      int f = inputString.indexOf('F');
      int g = inputString.indexOf('G');
      int h = inputString.indexOf('H');
      int i = inputString.indexOf('I');
      int j = inputString.indexOf('J');
      int k = inputString.indexOf('K');
      int l = inputString.indexOf('L');
      int fcs = inputString.substring(k+1,l).toInt();
```

```
    int jml_data =  inputString.substring(a,k+1).length();

    if (fcs == jml_data){
      //Serial.println(inputString);
      voltSolar1    = inputString.substring(a+1,b);
      ampSolar1     = inputString.substring(b+1,c);
      percentBatt1  = inputString.substring(c+1,d);
      voltBatt1     = inputString.substring(d+1,e);
      ampBatt1      = inputString.substring(e+1,f);
      voltSolar2    = inputString.substring(f+1,g);
      ampSolar2     = inputString.substring(g+1,h);
      percentBatt2  = inputString.substring(h+1,i);
      voltBatt2     = inputString.substring(i+1,j);
      ampBatt2      = inputString.substring(j+1,k);
    }
    inputString="";
  }
 }
}
```

Lampiran 3
Lembar Bimbingan

UNIVERSITAS MUHAMMADIYAH SURABAYA
FAKULTAS TEKNIK
JURUSAN: MESIN, ELEKTRO, PERKAPALAN, SIPIL, ARSITEKTUR, D3 KOMPUTER, INDUSTRI
Alamat : Jalan Sutorejo 59 Surabaya
Telp./Fax. 031-3811966 ext.118 WhatsApp : 0857-8486-1787

CATATAN BIMBINGAN SKRIPSI

Nama : Ade Kortiko Fanani
NIM : 20181330074
Judul Skripsi : RANCANG BANGUN SISTEM MANAJEMEN DAYA BATERAI *PHOTOVOLTAIC* PADA KOLAM IKAN BERBASIS ARDUINO DAN *INTERNET OF THINGS* (IoT)
Pembimbing Utama : Dr. Dwi Songgo Panggayudi, ST., MM., IPM
Pembimbing Pendamping : Rudi Irmawanto, S.T,M.T
Mulai Bimbingan : 1 September 2021

No.	Tgl	Materi	Paraf Pembimbing		Paraf Mahasiswa
			U*	P**	
1.	5/9/2020	Penentuan Judul dan Pendahuluan			
2.	19/9/2020	Bab 1, batasan masalah			
3.	26/9/2020	Bab 1 dan Bab 2			
4.	3/10/2020	Bab 3 Tinjauan Pustaka			
5.	10/10/2020	Perbaikan Tinjauan pustaka dan literatur			
6.	17/10/2020	Pematangan Bab 1,2 dan 3			
7.	24/10/2020	Pematangan SEMPRO			
8.	14/11/2020	Perencanaan desain			
9.	28/11/2020	Revisi Desain			
10.	6/2/2021	Pembuatan alat			
11.	10/4/2021	Perbaikan Bahan dan alat			
12.	22/4/2021	Perbaikan software IoT			
13.	24/4/2021	Pembuatan dan studi Software BMS			
14.	1/5/2021	Pengambilan data			
15.	20/5/2021	Analisa dan Kesimpulan			
16.	27/3/2021	Pemantapan Ujian Skripsi			

Surabaya, 25 Juni 2021

Pembimbing Utama Ditandatangani ketika skripsi tuntas	Pembimbing Pendamping Ditandatangani ketika skripsi tuntas
(Dr. Dwi Songgo Panggayudi, ST., MM., IPM)	(Rudi Irmawanto, S.T,M.T)

Catatan:
1. *U artinya Utama dan **P artinya Pendamping.
2. Jika Mahasiswa sudah memberikan atau mengirimkan draft proposal atau skripsi maka ybs wajib menuliskannya dalam Catatan Bimbingan Skripsi yang kemudian ditandatangi oleh Pembimbing.

Bimbingan dinyatakan selesai

Lampiran 4
Lembar Evaluasi Penguji

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Jl. Sutorejo 59 Telp. (031) 381-1966 Fax. (031) 381-3096 Surabaya

Hasil Evaluasi Ujian Skripsi

Nama Mahasiswa : Ade Kortiko Fanani

Nomor Induk Mahasiswa : 20181330074

Program Studi : Teknik Elektro

Judul Skripsi : Rancang Bangun Sistem Manajemen Daya Baterai Photovoltaic Pada Kolam Ikan Nila Berbasis Arduino Dan Internet Of Things (IoT)

No	Uraian Perbaikan	Halaman
	-	

Lembar ini harus dibawa saat persetujuan perbaikan.

Surabaya, 29 Mei 2021
Ketua Penguji

(Dr. Indah Kurniawati, S.T., M.T.)

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Hasil Evaluasi Ujian Skripsi

Nama Mahasiswa : Ade Kortiko Fanani

Nomor Induk Mahasiswa : 20181330074

Program Studi : Teknik Elektro

Judul Skripsi : Rancang Bangun Sistem Manajemen Daya Baterai Photovoltaic Pada Kolam Ikan Nila Berbasis Arduino Dan Internet Of Things (IoT)

No	Uraian Perbaikan	Halaman
1	1. Judul perlu ditinjau lagi 2. Permasalahan no.3 perlu diperbaiki 3. Format penulisan untuk bab II TINJAUAN PUSTAKA . sebaiknya ditulis : - 2.1 Peneliti terdahulu…….dst. - 2.2 Landasan teori … dst. 4. Untuk Bab III Metode Penelitian: belum ada diagram alir tentang perencanaan pembuatan alat baik itu hardware atau software atau system. 5. Untuk BAB IV PEMBAHASAN : berisi pembuatan alat, uji coba alat dan analisa data hasi uji coba. 6. Untuk BAB V Kesimpulan 7. Jadi salah satu aturan penulisan Laporan skripsi itu adalah terdiri dari 5 BAB : BAB I PENDAHULUAN BAB II TINJAUAN PUSTAKA BAB III METODE PENELITIAN BAB IV PEMBAHASAN BAB V KESIMPULAN	

Lembar ini harus dibawa saat persetujuan perbaikan.

Surabaya, 29 Mei 2021
Penguji 1

(Ir. Suprapdi, M.T.)

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Hasil Evaluasi Ujian Skripsi

Nama Mahasiswa : Ade Kertiko Fanani

Nomor Induk Mahasiswa : 20181330074

Program Studi : Teknik Elektro

Judul Skripsi : Rancang Bangun Sistem Manajemen Daya Baterai Photovoltaic Pada Kolam Ikan Nila Berbasis Arduino Dan Internet Of Things (IoT)

No	Uraian Perbaikan	Halaman
	Sesuai revisi ketika sidang	

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Surabaya, 29 Mei 2021

Penguji 2

(Dr. Eng. Marwan Rosyadi, S.T., M.T.)

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Jl. Sutorejo 59 Telp. (031) 381-1966 Fax. (031) 381-3096 Surabaya

Hasil Evaluasi Ujian Skripsi

Nama Mahasiswa : Ade Kortiko Fanani

Nomor Induk Mahasiswa : 20181330074

Program Studi : Teknik Elektro

Judul Skripsi : Rancang Bangun Sistem Manajemen Daya Baterai Photovoltaic Pada Kolam Ikan Nila Berbasis Arduino Dan Internet Of Things (IoT)

No	Uraian Perbaikan	Halaman
	-	

Lembar ini harus dibawa saat persetujuan perbaikan.

Surabaya, 29 Mei 2021

Penguji 3

(Rudi Irmawanto, S.T., M.T.)

Lampiran 5
Hasil Cek Plagiasi

PERPUSTAKAAN
UNIVERSITAS MUHAMMADIYAH SURABAYA

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Naskah tugas akhir ~~/ skripsi / karya tulis / tesis~~*) yang diserahkan atas :

N a m a	: Ade Kortiko Fanani
N I M	: 20181330074
Fakultas/Jurusan	: Teknik Elektro
Alamat	: Wonoayu RT 04 RW 07 Kecamatan Gempol Kabupaten Pasuruan
Judul	: Rancang Bangun Sistem Manajemen Daya Baterai *Photovoltaic* Pada Kolam Ikan Berbasis Arduino Dan *Internet Of Things* (Iot).

telah **diserahkan dan memenuhi kriteria** batas maksimal yang sudah ditentukan.

Surabaya, .2 Juli 2021

Petugas perpustakaan

Ardi Surya Harkit Kusuma

Mahasiswa,

Ade Kortiko Fanani

Mengetahui,
Kepala Perpustakaan

Drs. Yarno, M.Pd

) DILARANG KERAS MENYEBARLUASKAN FORM INI

hasil plagiasi Ade Kortiko Fanani

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Lampiran 6
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Jl. Sutorejo 59 Surabaya 60113 Telp. 031-3811966, 3811967 Ext (130) Gd. A Lt 2
Email: pusba.umsby@gmail.com

ENDORSEMENT LETTER
194/PB-UMS/EL/VII/2021

This letter is to certify that the abstract of the thesis below

Tittle	:	Management System Design of Photovoltaic Battery Power in Fish Pool Based on Arduino and Internet of Things (IoT)
Student's name	:	Ade Kortiko Fanani
Reg. Number	:	20181330074
Department	:	S1 Teknik Elektro

has been endorsed by Pusat Bahasa *UMSurabaya* for further approval by the examining committee of the faculty.

Surabaya, 5 July 2021
Chair

Dr. Waode Hamsia, M.Pd

Lampiran 5
Surat Keterangan Bebas Perpus

FM-002-PERPUS-06

PERPUSTAKAAN
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ASLI

SURAT KETERANGAN BEBAS PINJAM

Dengan ini menyatakan bahwa :

Nama : ADE KURTIKO FANANI
NIM : 2018133 0074
Fakultas/ Jurusan : TEKNIK / ELEKTRO
Alamat : WONOAYU RT: 4 RW: 02 GEMPOL PASCRUAN
No. Telp/ HP : 081233024001

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Surat keterangan ini digunakan untuk: ***Cuti Kuliah/ Pengambilan Ijazah/ Pindah Kuliah*** *)

Surabaya, 31 Mei 2021

Mengetahui,
Kepala Perpustakaan

Drs. Yanto, M.Pd.

Petugas Perpustakaan,

Hariyanto B8

*) Coret yang tidak perlu