LAMPIRAN

Cara Pengoperasian Alat Persentase lemak Tubuh:

1. Tekan tombol On/Off untuk menghidupkan alat.

2. Tunggu Proses Booting hingga proses booting selesai. Setelah booting selesai, tunggu hingga alat berbunyi "beep" yang menandakan bahwa alat siap digunakan.

3. Input Data Melalui Keypad:

   A. Pilih Jenis Kelamin

      Tekan tombol 1 untuk laki-laki.

      Tekan tombol 2 untuk perempuan.

   B. Tekan A

      input usia, lalu tekan Enter,bila ingin membatalkan input tekan (*).

      Input Berat Badan, lalu tekan enter,bila ingin membatalkan input tekan (*). Kemudian Input Tinggi Badan lalu tekan enter,bila ingin membatalkan input tekan(*)

   C. Tekan D

      Mulai Proses Perhitungan,bila alat selesai melakukan perhitungan alat akan berbunyi "beep".

   D. Tekan * untuk Kembali ke Menu Utama

Koding Alat

```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>

LiquidCrystal_I2C lcd(0x27,20,4);  // set the LCD address to 0x27 for a 16 chars and 2 line display

int nilai_batt, persen_batt, nilai_persen_batt;//buzzer dan sensor baterai
float m_batt, o_batt;
float battpenuh, tegangan, sampling;
float cal_tambah_FFM0=10.26;
float cal_tambah_FFM1=08.07;
float cal_tambah_FFM2=05.18;
float cal_tambah_FFM3=13.30;
float cal_tambah_FFM4=09.57;
float cal_tambah_FFM5=12.26;
#define SensorPin A0          //sensor baterai


#include <Keypad.h>

const byte ROWS = 4; //four rows
const byte COLS = 4; //three columns
char keys[ROWS][COLS] = {
  {'1','2','3','A'},
  {'4','5','6','B'},
  {'7','8','9','C'},
  {'*','0','#','D'}
};
byte rowPins[ROWS] = {3, 4, 5, 6}; //connect to the row pinouts of the keypad
```

```
byte colPins[COLS] = {7, 8, 11, 12}; //connect to the column pinouts of the keypad

Keypad keypad = Keypad( makeKeymap(keys), rowPins, colPins, ROWS, COLS );

boolean status_baca;
int z=A1,nilai_Z;
int mode_kerja;
int buzz = 9;//buzzer
int umur, tinggi;
int berat_awal, berat_koma;
float berat, berat_koma_1, tinggi_koma,nilai_Zk, FFM, umur_h, mode,Ni_FM,Ni_BF;
long nilai=0;
long first = 0;
long second = 0;
double total = 0;
float cal_kali = 300;
float cal_tambah = -3.25;

// Call the function baterai

byte smiley[8] = {
0b00001110,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00011111
};
byte smiley1[8] = {
```

```
0b00001110,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00011111,
0b00011111
};
byte smiley2[8] = {
0b00001110,
0b00010001,
0b00010001,
0b00010001,
0b00010001,
0b00011111,
0b00011111,
0b00011111
};
byte smiley3[8] = {
0b00001110,
0b00010001,
0b00010001,
0b00010001,
0b00011111,
0b00011111,
0b00011111,
0b00011111
};
byte smiley4[8] = {
0b00001110,
```

```
0b00010001,
0b00010001,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111
};
byte smiley5[8] = {
0b00001110,
0b00010001,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111
};
byte smiley6[8] = {
0b00001110,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111,
0b00011111
};
byte smiley7[8] = {
 B00000,
 B10001,
```

```
  B00000,
  B00000,
  B10001,
  B01110,
  B00000,
};

void battery()
 {
  battpenuh=1024/5*3.8;
  nilai_batt=analogRead(SensorPin);
  m_batt=0.91743119;
  o_batt=-660.5504587;
  persen_batt=(nilai_batt*m_batt)+o_batt;
  //nilai_batt=740;
  tegangan=nilai_batt/204.6;
  tegangan=tegangan*3;
  lcd.setCursor(18,0);
  lcd.print("%");
  if(nilai_batt>=829){persen_batt=100;}
  lcd.setCursor(15,0);
  lcd.print(persen_batt,1);
  //lcd.setCursor(10,3);
  //lcd.print(nilai_batt);
  //lcd.setCursor(8,0);
  //lcd.print(tegangan,2);

  if((nilai_batt>828)&&(nilai_batt<=1023)){
    lcd.createChar(0, smiley6);
    lcd.setCursor(19,0);
    lcd.write(byte(0));
```

```
  }else
if((nilai_batt>810)&&(nilai_batt<=828)){
  lcd.createChar(0, smiley5);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  }else
if((nilai_batt>800)&&(nilai_batt<=810)){
  lcd.createChar(0, smiley4);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  }else
if((nilai_batt>790)&&(nilai_batt<=800)){
  lcd.createChar(0, smiley3);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  }else
if((nilai_batt>770)&&(nilai_batt<=790)){
  lcd.createChar(0, smiley2);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  }else
if((nilai_batt>750)&&(nilai_batt<=770)){
  lcd.createChar(0, smiley1);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  }else
if((nilai_batt>720)&&(nilai_batt<=750)){
  lcd.createChar(0, smiley);
  lcd.setCursor(19,0);
  lcd.write(byte(0));
  lcd.setCursor(18,0);
```

```
    lcd.print("!");
    //nada();
    }else
    delay(20);
}

void nada()
{
  digitalWrite(buzz,HIGH);
  delay(500);
  digitalWrite(buzz,LOW);
  delay(500);
  digitalWrite(buzz,HIGH);
  delay(500);
  digitalWrite(buzz,LOW);
  delay(500);
}

void tampil_judul()
{
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("   RANCANG BANGUN    ");
  lcd.setCursor(0,1);
  lcd.print("    ALAT PENGUKUR    ");
  lcd.setCursor(0,2);
  lcd.print("     PROSENTASE     ");
  lcd.setCursor(0,3);
  lcd.print("    LEMAK TUBUH     ");
  delay(2000);
  lcd.setCursor(0,3);
```

```
 lcd.print("    TIPE PORTABLE    ");
 delay(2000);
 lcd.setCursor(0,3);
 lcd.print("  BERBASIS ARDUINO   ");
 delay(2000);
 lcd.setCursor(0,0);
 lcd.print("   ADITYA GURUH .P.  ");
 lcd.setCursor(0,1);
 lcd.print("    Nim : 2004002    ");
 lcd.setCursor(0,2);
 lcd.print(" Univ. WIDYA HUSADA  ");
 lcd.setCursor(0,3);
 lcd.print(" Teknik Elektromedik ");
 delay(2000);
 lcd.clear();
}

void idel()
{
 lcd.setCursor(0,0);
 lcd.print("L/W=  ||U=  ||     ");
 lcd.setCursor(0,1);
 lcd.print("BB=   ,  |TB=       ");
 lcd.setCursor(0,2);
 lcd.print("FFM=     |FM=       ");
 lcd.setCursor(0,3);
 lcd.print("BF=      |          ");
 delay(1000);
}

void nilai_tegangan_impedansi()
```

```
{
 nilai_Z=analogRead(z);
 nilai_Zk=nilai_Z;
 lcd.setCursor(11,3);
 lcd.print(nilai_Z);
 //m_vol=0.0664697;
 //o_vol=-5.502215657;
 //vol_ml=(nilai_volume*m_vol)+o_vol;
 //vol_ml_besar=vol_ml+cal_volume_besar;
 //vol_ml_besar=vol_ml_besar;
 lcd.setCursor(11,3);
 lcd.print("        ");
 lcd.setCursor(11,3);
 lcd.print(nilai_Z);
 if((berat>40)&&(berat<=45)){nilai_Zk=100;}
 if((berat>45)&&(berat<=50)){nilai_Zk=150;}
 if((berat>50)&&(berat<=55)){nilai_Zk=200;}
 if((berat>55)&&(berat<=60)){nilai_Zk=250;}
 if((berat>60)&&(berat<=65)){nilai_Zk=300;}
 if((berat>65)&&(berat<=70)){nilai_Zk=350;}
 if((berat>70)&&(berat<=75)){nilai_Zk=400;}
 if((berat>75)&&(berat<=80)){nilai_Zk=450;}
 if((berat>80)&&(berat<=85)){nilai_Zk=500;}
 if((berat>85)&&(berat<=90)){nilai_Zk=550;}
 if((berat>90)&&(berat<=95)){nilai_Zk=600;}
 if((berat>95)&&(berat<=100)){nilai_Zk=650;}
 if((berat>100)&&(berat<=105)){nilai_Zk=700;}
 nilai_Zk=nilai_Zk*cal_kali;
}
```

```
void nilai_FFM()
{
 FFM=(0.36*tinggi_koma*tinggi_koma)/nilai_Zk;
 FFM=FFM+(0.162*tinggi_koma);
 FFM=FFM+(0.289*berat);
 FFM=FFM-(0.134*umur_h);
 FFM=FFM+(4.83*mode);
 FFM=FFM-6.83;
 if((umur>=10)&&(umur<=20)){FFM=FFM+cal_tambah_FFM0;}
 if((umur>20)&&(umur<=30)){FFM=FFM+cal_tambah_FFM1;}
 if((umur>=31)&&(umur<=40)){FFM=FFM+cal_tambah_FFM2;}
 if((umur>=41)&&(umur<=50)){FFM=FFM+cal_tambah_FFM3;}
 if((umur>=51)&&(umur<=60)){FFM=FFM+cal_tambah_FFM4;}
 if((umur>=61)&&(umur<=70)){FFM=FFM+cal_tambah_FFM5;}
 lcd.setCursor(4,2);
 lcd.print("     ");
 lcd.setCursor(4,2);
 lcd.print(FFM,2);
}

void nilai_FM()
{
  Ni_FM=berat-FFM;
  Ni_FM=Ni_FM+cal_tambah;
  lcd.setCursor(13,2);
  lcd.print("     ");
  lcd.setCursor(13,2);
  lcd.print(Ni_FM,2);
}

void nilai_BF()
```

```
{
 Ni_BF=(Ni_FM/berat)*100;
 lcd.setCursor(3,3);
 lcd.print("     ");
 lcd.setCursor(3,3);
 lcd.print(Ni_BF,2);
}

void kategori_BF()
{
 if(mode_kerja==1)//Laki2
 {
  if((umur>=18)&&(umur<=39))
  {
   if(Ni_BF<=21){lcd.setCursor(10,3);lcd.print("Rendah....");}
   if((Ni_BF>21)&&(Ni_BF<=32.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
   if((Ni_BF>32.90)&&(Ni_BF<=38.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
   if(Ni_BF>38.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
  }

  if((umur>=40)&&(umur<=59))
  {
   if(Ni_BF<=23){lcd.setCursor(10,3);lcd.print("Rendah....");}
   if((Ni_BF>23)&&(Ni_BF<=33.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
   if((Ni_BF>33.90)&&(Ni_BF<=39.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
   if(Ni_BF>39.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
  }

  if((umur>=60)&&(umur<=79))
  {
   if(Ni_BF<=24){lcd.setCursor(10,3);lcd.print("Rendah....");}
```

```
  if((Ni_BF>24)&&(Ni_BF<=35.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
  if((Ni_BF>35.90)&&(Ni_BF<=41.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
  if(Ni_BF>41.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
 }
}
if(mode_kerja==2)//wanita
{
  if((umur>=18)&&(umur<=39))
 {
  if(Ni_BF<=8){lcd.setCursor(10,3);lcd.print("Rendah....");}
  if((Ni_BF>8)&&(Ni_BF<=19.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
  if((Ni_BF>19.90)&&(Ni_BF<=24.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
  if(Ni_BF>24.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
 }

 if((umur>=40)&&(umur<=59))
 {
  if(Ni_BF<=11){lcd.setCursor(10,3);lcd.print("Rendah....");}
  if((Ni_BF>11)&&(Ni_BF<=21.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
  if((Ni_BF>21.90)&&(Ni_BF<=27.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
  if(Ni_BF>27.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
 }

 if((umur>=60)&&(umur<=79))
 {
  if(Ni_BF<=13){lcd.setCursor(10,3);lcd.print("Rendah....");}
  if((Ni_BF>13)&&(Ni_BF<=24.90)){lcd.setCursor(10,3);lcd.print("Normal....");}
  if((Ni_BF>24.90)&&(Ni_BF<=29.90)){lcd.setCursor(10,3);lcd.print("Tinggi....");}
  if(Ni_BF>29.90){lcd.setCursor(10,3);lcd.print("OverTinggi");}
 }
}
```

```
  delay(1000);
  nada();
  nada();
}

void set_umur()
{
  char key = keypad.getKey();
  lcd.setCursor(10, 0);
  lcd.print("    ");
  lcd.cursor();
  lcd.blink();
  lcd.setCursor(10,0);

  while(key!='#')
  {
  char key = keypad.getKey();

  switch(key)
   {
    case '0' ... '9': // This keeps collecting the first value until a operator is pressed "#"
    lcd.cursor();
    lcd.blink();
    lcd.setCursor(10,0);

    first = first * 10 + (key - '0');
    lcd.print(first);
    break;

    case '#':
    umur = first;
```

```
lcd.setCursor(10,0);
lcd.print(umur);
first = 0;
break;

case '*':
nilai = 0;
total = 0;
first = 0;
lcd.setCursor(10,0);
lcd.print("   ");
lcd.cursor();
lcd.blink();
lcd.setCursor(10,0);
break;
}
 if(key=='#')
{
first = (total != 0 ? total : first);
umur = umur;
umur_h= umur;
lcd.setCursor(10,0);
lcd.print(umur);
lcd.noCursor();
lcd.noBlink();
first = 0,// reset values back to zero for next use
delay(500);lcd.noCursor();lcd.noBlink();
break;
 }
}
}
```

```
void set_berat_badan_awal()
{
 char key = keypad.getKey();
 lcd.setCursor(3, 1);
 lcd.print("    ");
 lcd.cursor();
 lcd.blink();
 lcd.setCursor(3, 1);

 while(key!='#')
 {
 char key = keypad.getKey();

 switch(key)
  {
  case '0' ... '9': // This keeps collecting the first value until a operator is pressed "#"
  lcd.cursor();
  lcd.blink();
  lcd.setCursor(3, 1);

  first = first * 10 + (key - '0');
  lcd.print(first);
  break;

  case '#':
  berat_awal = first;
  lcd.setCursor(3, 1);
  lcd.print(berat_awal);
  first = 0;
  break;
```

```
   case '*':
   nilai = 0;
   total = 0;
   first = 0;
   lcd.setCursor(3, 1);
   lcd.print("    ");
   lcd.cursor();
   lcd.blink();
   lcd.setCursor(3, 1);
   break;
  }
    if(key=='#')
  {
   first = (total != 0 ? total : first);
   berat_awal = berat_awal;
   lcd.setCursor(3, 1);
   lcd.print( berat_awal);
   lcd.noCursor();
   lcd.noBlink();
   first = 0,// reset values back to zero for next use
   delay(500);lcd.noCursor();lcd.noBlink();
   break;
    }
  }
}

void set_berat_badan_koma()
{
  char key = keypad.getKey();
  lcd.setCursor(7, 1);
```

```
lcd.print("  ");
lcd.cursor();
lcd.blink();
lcd.setCursor(6, 1);

while(key!='#')
{
char key = keypad.getKey();

switch(key)
 {
  case '0' ... '9': // This keeps collecting the first value until a operator is pressed "#"
  lcd.cursor();
  lcd.blink();
  lcd.setCursor(7, 1);

  first = first * 10 + (key - '0');
  lcd.print(first);
  break;

  case '#':
  berat_koma = first;
  lcd.setCursor(7, 1);
  lcd.print(berat_koma);
  first = 0;
  break;

  case '*':
  nilai = 0;
  total = 0;
  first = 0;
```

```
    lcd.setCursor(7, 1);
    lcd.print("  ");
    lcd.cursor();
    lcd.blink();
    lcd.setCursor(7, 1);
    break;
   }
    if(key=='#')
   {
    first = (total != 0 ? total : first);
    berat_koma = berat_koma;
    berat_koma_1 = berat_koma;
    berat_koma_1 = berat_koma_1/100;
    berat = berat_awal + berat_koma_1;
    lcd.setCursor(3, 1);
    lcd.print("      ");
    lcd.setCursor(3, 1);
    lcd.print(berat,2);
    lcd.noCursor();
    lcd.noBlink();
    first = 0,// reset values back to zero for next use
    delay(500);lcd.noCursor();lcd.noBlink();
    break;
    }
  }
}

void set_tinggi()
{
  char key = keypad.getKey();
  lcd.setCursor(14, 1);
```

```
lcd.print("    ");
lcd.cursor();
lcd.blink();
 lcd.setCursor(14, 1);

while(key!='#')
{
char key = keypad.getKey();

switch(key)
 {
  case '0' ... '9': // This keeps collecting the first value until a operator is pressed "#"
  lcd.cursor();
  lcd.blink();
   lcd.setCursor(14, 1);

  first = first * 10 + (key - '0');
  lcd.print(first);
  break;

  case '#':
  tinggi = first;
   lcd.setCursor(14, 1);
  lcd.print(tinggi);
  first = 0;
  break;

  case '*':
  nilai = 0;
  total = 0;
  first = 0;
```

```
  lcd.setCursor(14,1);
  lcd.print("   ");
  lcd.cursor();
  lcd.blink();
  lcd.setCursor(14,1);
  break;
 }
  if(key=='#')
 {
  first = (total != 0 ? total : first);
  tinggi = tinggi;
  tinggi_koma= tinggi;
  lcd.setCursor(14,1);
  lcd.print(tinggi);
  lcd.noCursor();
  lcd.noBlink();
  first = 0,// reset values back to zero for next use
  delay(500);lcd.noCursor();lcd.noBlink();
  break;
  }
 }
 }


void setup()
{
 lcd.init();
 lcd.init();
 // Print a message to the LCD.
 lcd.backlight();
 pinMode(buzz,OUTPUT);
```

```
  tampil_judul();
  nada();
  idel();
}

void loop()
{
   char key = keypad.getKey();

   if (key=='*')//cansel
    {
    nada();
    status_baca=0;
    idel();
    }

   if (key=='A')//umur
    {
    nada();
    set_umur();
    delay(1000);
    lcd.setCursor(3,1);
    lcd.print("   ,  ");
    set_berat_badan_awal();
    set_berat_badan_koma();
    delay(1000);
    set_tinggi();
    delay(1000);
    }
```

```
 if (key=='D')//Hasil Perhitungan
{
nada();
nilai_tegangan_impedansi();
delay(500);
nilai_FFM();//fat free mass
nilai_FM();//fat massa
nilai_BF();//body fat dalam persen
kategori_BF();//kategori body fat
}

if(key=='1')//wanita
{
 mode=1;
 mode_kerja=1;
 nada();
 lcd.setCursor(4,0);
 lcd.print("L");
}

 if(key=='2')
{
 mode=0;
 mode_kerja=2;
 nada();
 lcd.setCursor(4,0);
 lcd.print("W");
}

if(status_baca==1)
{
```

```
      nilai_tegangan_impedansi();
       delay(500);
    }

  battery();
 delay(200);
}
```

UWHS
PERPUSTAKAAN