```
#include <Wire.h>
#include <LiquidCrystal_I2C.h>
LiquidCrystal_I2C lcd(0x27,20,4);
#include "MAX30105.h"          //MAX3010x library
#include "heartRate.h"         //Heart rate calculating algorithm
float vref = 3.3;
int beatAvg1;
float resolution = vref/1023;
void printRandoms(int lower, int upper, int count);
#define BLYNK_PRINT Serial
#include <ESP8266WiFi.h>
#include <BlynkSimpleEsp8266.h>
void spo2();
int s;
int led=D4;
int temp_adc_val;
  float temp_val;
  float f;
MAX30105 particleSensor;
const byte RATE_SIZE = 4; //Increase this for more averaging. 4 is good.
byte rates[RATE_SIZE]; //Array of heart rates
byte rateSpot = 0;
long lastBeat = 0; //Time at which the last beat occurred
float beatsPerMinute;
int beatAvg;
void reading();
long irValue;
int a=D0;
char auth[] = "dM4uMNYyq1sjokTxbNk1nL-4AZq1e_oJ";
char ssid[] = "password";
char pass[] = "password";
int l=D0;
void setup() {
  Serial.begin(9600);
  pinMode(led,OUTPUT);
  pinMode(l,OUTPUT);
  pinMode(a,INPUT);
  lcd.init();
  lcd.backlight();
  lcd.setCursor(0,0);
  lcd.print("EMF");
  delay(500);
  lcd.setCursor(0,0);
  lcd.print("Health Monitor");
  lcd.setCursor(0,1);
  lcd.print("Sensor Init");
  delay(2000);
  lcd.clear();
  lcd.setCursor(0,0);
  lcd.print("Connecting to");
  lcd.setCursor(0,1);
  lcd.print("    Wifi ");
  WiFi.begin(ssid, pass);
  while (WiFi.status() != WL_CONNECTED) {
    digitalWrite(l,1);
    delay(500);
    Serial.print(".");
    digitalWrite(l,0);
    delay(500);
    }
  Serial.println();
  digitalWrite(l,1);
  Serial.println("WiFi connected");
  Serial.println("IP address: ");
  lcd.clear();
  lcd.print("WiFi Connected");
  delay(500);
  particleSensor.begin(Wire, I2C_SPEED_FAST); //Use default I2C port, 400kHz speed
  particleSensor.setup(); //Configure sensor with default settings
  particleSensor.setPulseAmplitudeRed(0x0A); //Turn Red LED to low to indicate sensor
is running
  Blynk.begin(auth, ssid, pass);
}

void loop() {
 reading();
 beatAvg1=map(beatAvg,0,150,60,250);
 Blynk.run();
}
void reading()
{
  long irValue = particleSensor.getIR();
  if(irValue > 7000){
   //If a finger is detected
   lcd.clear();
   lcd.print("BPM:");
   lcd.print(beatAvg1);
   spo2();
   lcd.print(" SPo2:");
   lcd.print(s);
   lcd.setCursor(0,1);
  lcd.print("Temperature:");
  lcd.print(temp());
  delay(25);
  digitalWrite(led,0);

 if (checkForBeat(irValue) == true)                    //If a heart beat is detected
 {
  lcd.clear();
  lcd.print("BPM:");
  lcd.print(beatAvg1);
  spo2();
  lcd.print(" SPo2:");
  lcd.print(s);
  lcd.setCursor(0,1);
  lcd.print("Temperature:");
  lcd.print(temp());
  delay(25);
  digitalWrite(led,1);
  Blynk.virtualWrite(V2,s);
  Blynk.virtualWrite(V3,temp());
  Blynk.virtualWrite(V4,digitalRead(a));
  if(beatAvg1>40){
   Blynk.virtualWrite(V1,beatAvg1);
  }
  tone(3,1000);                                       //And tone the buzzer for a 100ms you can
reduce it it will be better
  delay(25);
  noTone(3);                                         //Deactivate the buzzer to have the effect of a
"bip"
  //We sensed a beat!
  long delta = millis() - lastBeat;                   //Measure duration between two beats
  lastBeat = millis();

  beatsPerMinute = 60 / (delta / 1000.0);          //Calculating the BPM

  if (beatsPerMinute < 255 && beatsPerMinute > 20)              //To calculate the average
we strore some values (4) then do some math to calculate the average
  {
   rates[rateSpot++] = (byte)beatsPerMinute; //Store this reading in the array
   rateSpot %= RATE_SIZE; //Wrap variable

   //Take average of readings
   beatAvg = 0;
   for (byte x = 0 ; x < RATE_SIZE ; x++)
    beatAvg += rates[x];
   beatAvg /= RATE_SIZE;
  }
 }



}
 if (irValue < 7000){       //If no finger is detected it inform the user and put the average
BPM to 0 or it will be stored for the next measure
  beatAvg=0;
  lcd.clear();
  lcd.print("Please Place");
  lcd.setCursor(0,1);
  lcd.print("  Finger  ");
  delay(25);
  noTone(3);
  }
```

```
}
void printRandoms(int lower, int upper, int count)
{
  int i;
  for (i = 0; i < count; i++) {
    int num = (rand() %
      (upper - lower + 1)) + lower;
    //Serial.println(num);
    s=num;
  }
}

void spo2()
{
 if(beatAvg>50 && beatAvg<85)
  {
   printRandoms(95,100,1);
  }
  if(beatAvg>100 && beatAvg<130)
  {
   printRandoms(95,105,1);
  }
   if(beatAvg<55)
  {
   printRandoms(85,95,1);
  }
  //delay(50);
}
float temp()
{
int analogValue = analogRead(A0);
```

```
float millivolts = (analogValue/1024.0) * 3300; //3300 is the voltage provided by NodeMCU
float celsius = millivolts/10;
Serial.print("in DegreeC=  ");
Serial.println(celsius);

//---------- Here is the calculation for Fahrenheit ----------//

float fahrenheit = ((celsius * 9)/5 + 32);
Serial.print(" in Farenheit=  ");
Serial.println(fahrenheit);
//delay(1000);

 return fahrenheit;
}
```