Bangladesh University OF Business and Technology (BUBT)

A Microprocessor Projects On

BMI Measurement Machine

COURSE CODE: CSE315

COURSE TITLE: Microprocessor and Interfacing Lab

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1. ABSTRACT:

The BMI Measurement Machine project aims to measure weight and height for people with the ability to keep a diet chart. Here, we use an HC-SR04 ultrasonic sensor that uses gold to determine the height distance of an object and a weight scale sensor that can convert weight into an equivalent electrical signal. This sensor is called a load cell, so in this project, we will use four load cells with the capacity to measure up to 50 kg as our Arduino weight sensor. Through this project people will be able to diagnose his BMI and see the smart diet chat for him which will help a person to lead a healthy life.

2. INTRODUCTION:

In this section, we will discuss the project's overview and purpose.

i) OVERVIEW:

The proponents developed a system that detects height and weight of a person that passed through the device and calculates their various weight classifications. This classification includes underweight or those human whose body weight is considered too low to be healthy, Normal, and overweight person who has some excess body fat relative to bone structure, height and obese or those individuals who has a lot of excess body fats. Through this system, the result will be given in just few seconds. The purpose of conducting this study and the intention of the proponents to pursue the designed project is to automate the BMI calculators in the hospitals to lessen the jobs of the nurses and to make a faster response to the patients; in the school feeding program, survey to save time and to make it easier for the staffs to determine which students are included in the program and needed health assistance. And for the fitness gyms, to help out the clients to easily check their health status.

ii) PURPOSE:

- Through this project, people will be able to measure BMI and see the smart diet chart which will help a person to lead a healthy life.
- It helps to measure the height, weight, and BMI with more accuracy and less error and automatically without help from any person.
- It reduces the cost of going to the gym.

3. LITERATURE REVIEW:

Here, we are going to describe the existing system and the proposed system's solution.

i) EXISTING PROJECT:

Our project is brand new. Such systems have not been developed before. The earlier projects are divided into three separate parts. The types of projects are height measurement, weight measurement, and BMI measurement IoT technology. The programmers present a medical instrument, called the Ultrasonic Measurer to measure human body height and weight using a non-contact approach. BMI measurement project also is IoT based. Our system brings these three separate projects together. This is the main difference between the existing systems and our proposed system.

ii) PROPOSED SYSTEM:

This project is divided into three portions. The first one is height measurement. It helps to measure the height with more accuracy and less error and automatically without help from any person. The second part is a weight measurement. The main component required to build this Arduino weighing scale is a sensor that can convert weight into an equivalent electrical signal. This sensor is called the load cell; we will use this load cell as our Arduino weight sensor. The load cell is a transducer that transforms force or pressure into electrical output. And lastly, add the BMI measuring value in this system. Body mass index (BMI) is a ratio of weight to height used to assess the degree of fatness or adiposity of an individual. The measurement is obtained from the calculation of weight in kilograms divided by height in meters squared. BMI is an assessment tool used to estimate the degree of overweight.

4. THEORATICAL BACKGROUND:

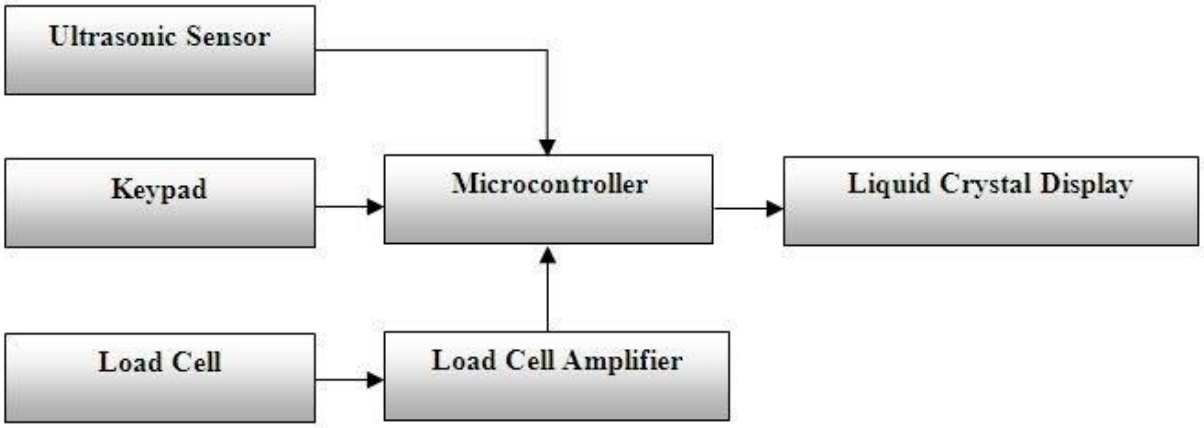


Figure 1: Block Diagram

5. SOFTWARE DESIGN:

The proponents use the waterfall development method in developing the software part by which the analyst proceeds sequentially from one place to the next.

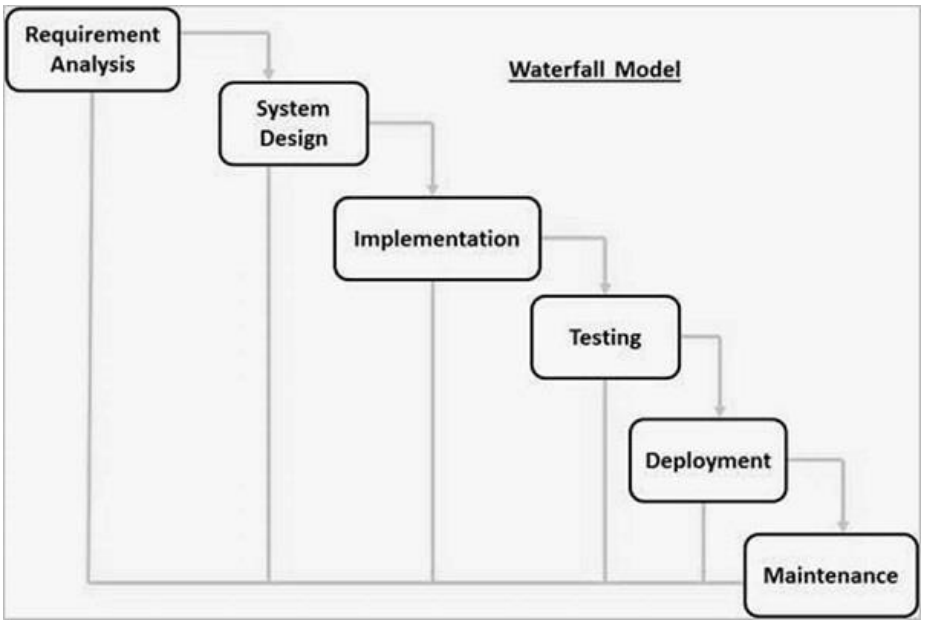


Figure 2: Waterfall Model

6. HARDWARE DESIGN WITH CIRCUIT DIAGRAM:

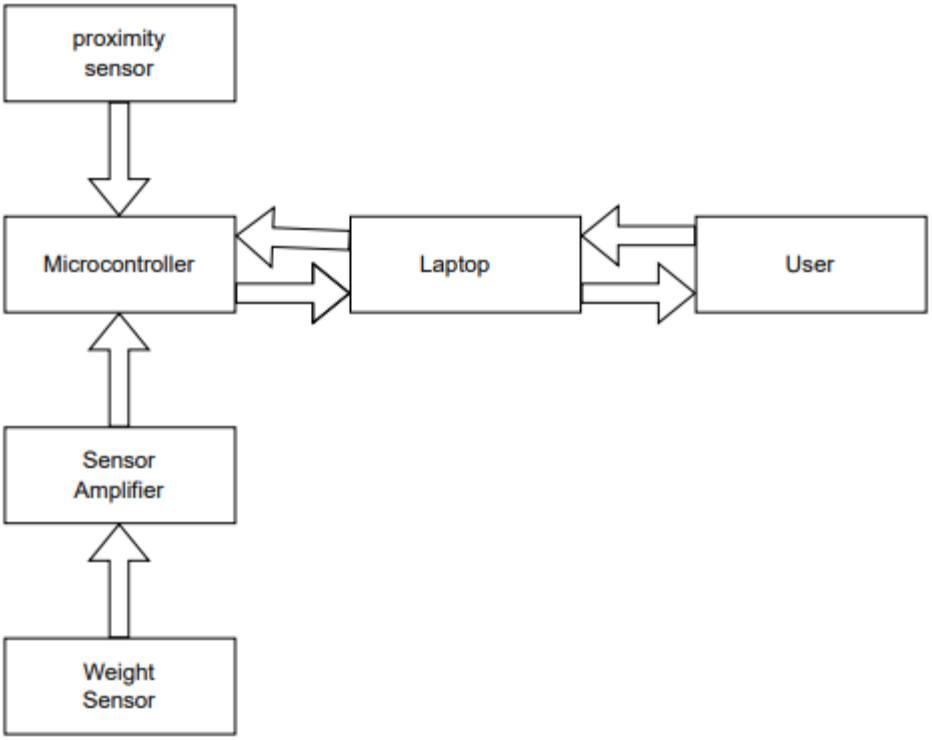


Figure 3: Hardware Design

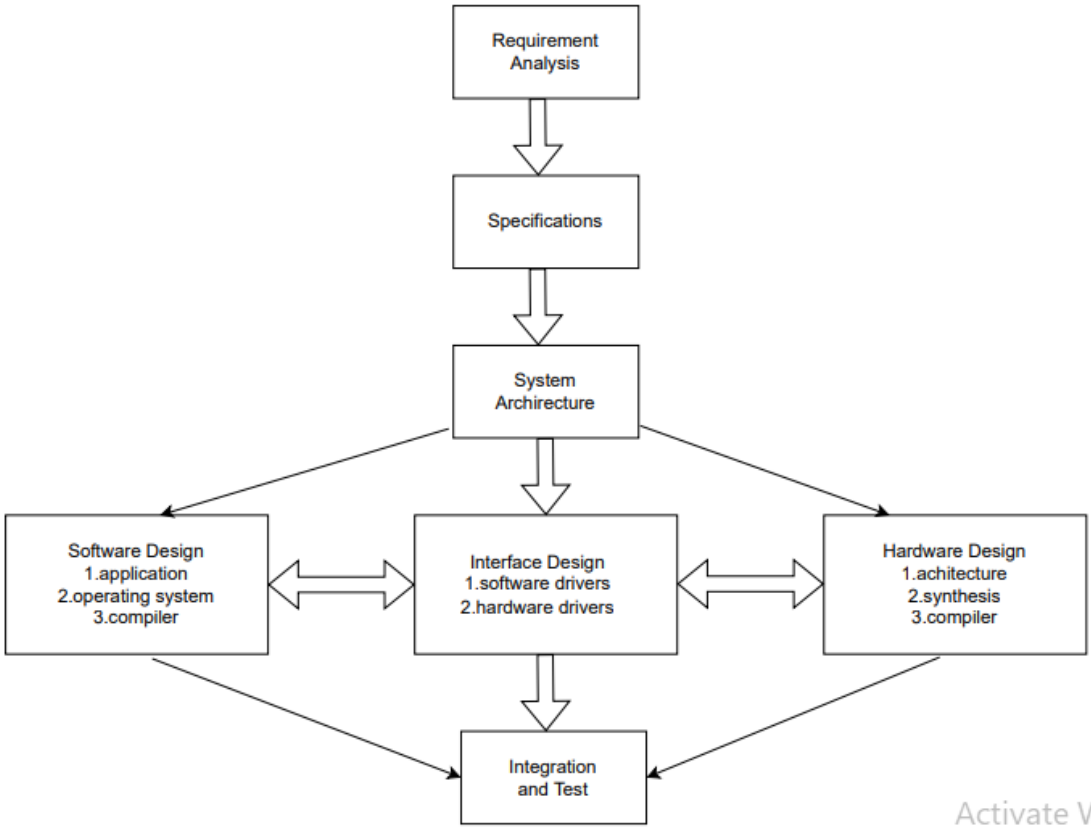
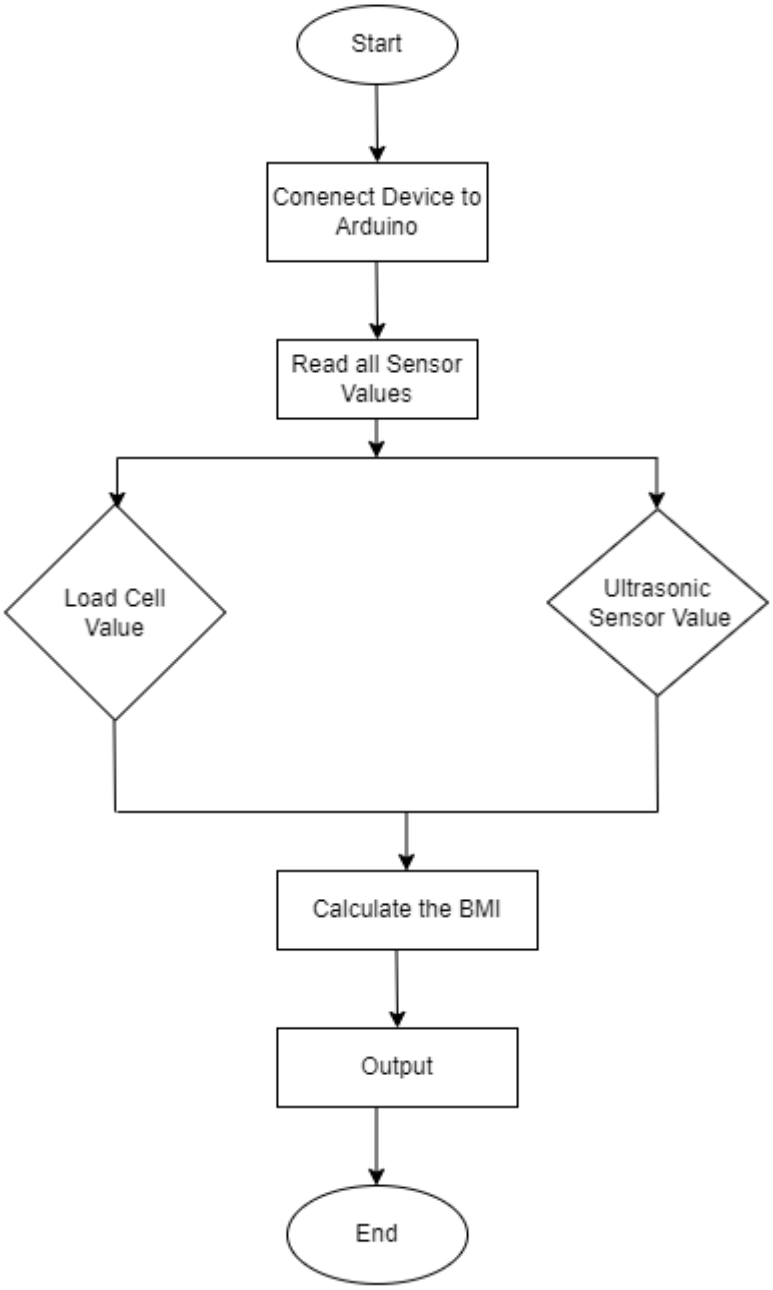
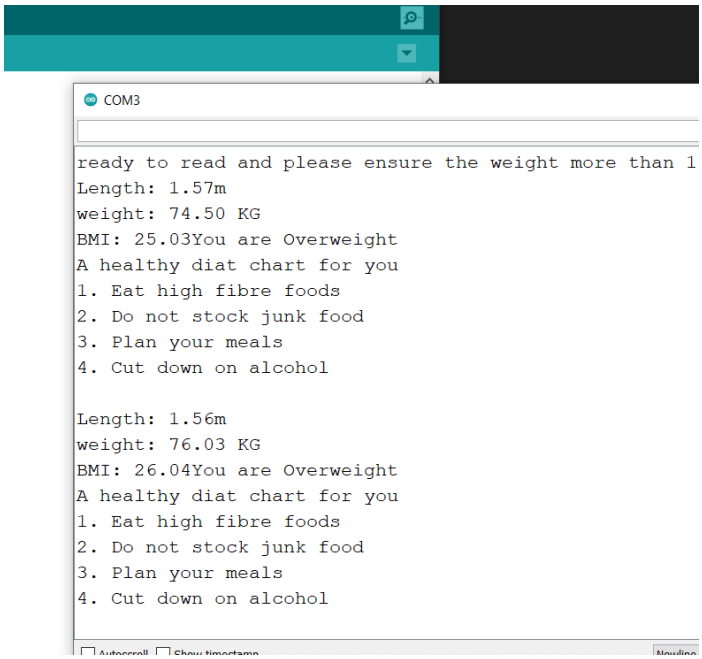


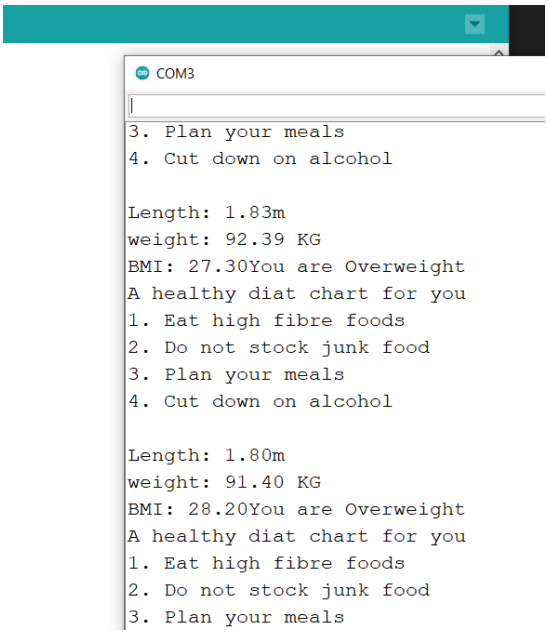
Figure 4: Design Process

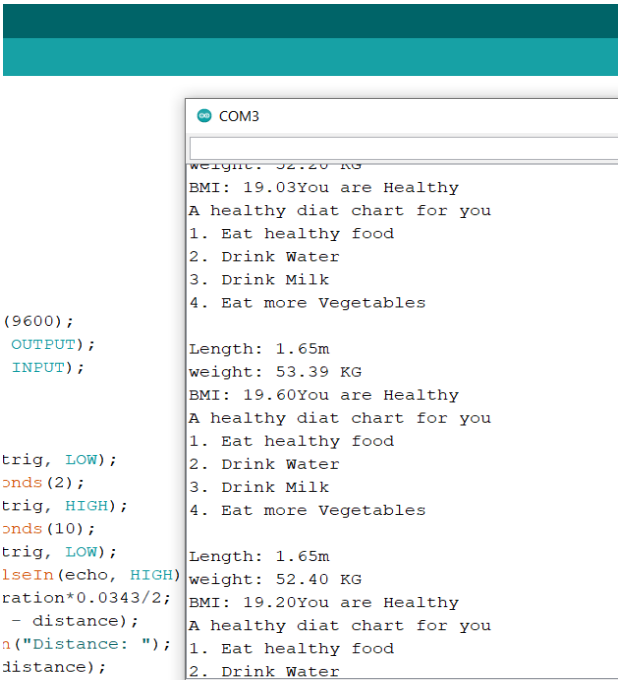
7. FLOWCHART:


Start
Conenect Device to Arduino
Read all Sensor Values
Load Cell Value
Ultrasonic Sensor Value
Calculate the BMI
Output
End

8. RESULT:


COM3
ready to read and please ensure the weight more than 1
Length: 1.57m
weight: 74.50 KG
BMI: 25.03You are Overweight
A healthy diat chart for you
1. Eat high fibre foods
2. Do not stock junk food
3. Plan your meals
4. Cut down on alcohol
Length: 1.56m
weight: 76.03 KG
BMI: 26.04You are Overweight
A healthy diat chart for you
1. Eat high fibre foods
2. Do not stock junk food
3. Plan your meals
4. Cut down on alcohol


COM3
3. Plan your meals
4. Cut down on alcohol
Length: 1.83m
weight: 92.39 KG
BMI: 27.30You are Overweight
A healthy diat chart for you
1. Eat high fibre foods
2. Do not stock junk food
3. Plan your meals
4. Cut down on alcohol
Length: 1.80m
weight: 91.40 KG
BMI: 28.20You are Overweight
A healthy diat chart for you
1. Eat high fibre foods
2. Do not stock junk food
3. Plan your meals


COM3
BMI: 19.03You are Healthy
A healthy diat chart for you
1. Eat healthy food
2. Drink Water
3. Drink Milk
4. Eat more Vegetables
Length: 1.65m
weight: 53.39 KG
BMI: 19.60You are Healthy
A healthy diat chart for you
1. Eat healthy food
2. Drink Water
3. Drink Milk
4. Eat more Vegetables
Length: 1.65m
weight: 52.40 KG
BMI: 19.20You are Healthy
A healthy diat chart for you
1. Eat healthy food
2. Drink Water

9. ADVANTAGES AND DISADVANTAGES:

i) The advantage of this study is to calculate the weight and height measurement and display its BMI measurement automatically upon entering into the system jamb and save the BMI measurement in the system and provide a diet chart depending on the BMI value.

ii) Series of tests were conducted and it reveals accurate results compared to the manual computation of BMI.

iii) It develops the device to provide and maintain the health status of the test subjects and to encourage person to have a proper diet for their health.

iv) The proponents analyzed the manual BMI calculation and automated it.

10. APPLICATIONS:

i) This system can be used in clinics and institutes that need BMI measurements for an easy calculation of their patient's BMI; the height stand must be folded or extendable for portable usage; and the platform in height stand for safety purposes should be attached.

ii) This system helps the attending nurse, physician or doctor to lessen their job and to monitor patient's health.

iii) The designed project has the ability to display the height and weight of a person and their weight classifications together with the target weight if he/she is overweight or underweight.

11. CONCLUSION:

The technology nowadays converted manual into automatic process, which becomes more efficient in everyday usage. Also, it is helpful for them because PCs now are needed at the workplace. The proponents used this as an advantage in monitoring the health status of patients or students. The supporters have analyzed, automated the BMI and designed the circuit that combined all the functions of the weight and proximity sensors and developed the software embedded in the microcontroller.

12. FUTURE WORK:

In future, we will try to add android based application.

13. REFERENCES:

a) https://create.arduino.cc/projecthub/kiroloskhairy/measure-your-height-by-ultrasonic-sensor-045500

b) https://create.arduino.cc/projecthub/embeddedlab786/arduino-based-digital-weight-scale-475032

c) https://create.arduino.cc/projecthub/mitov/arduino-and-visuino-measure-weight-with-hx711-and-load-cell-76de80

d) https://nevonprojects.com/automatic-bmi-calculator-using-load-cell-height-sensing/

14. APPENDIX:

```
#include "HX711.h"
#include <HCSR04.h>

HX711 scale(4, 3);
float calibration_factor = 2000; // this calibration factor is adjusted according to my load cell
float units;
float finalweight;
float duration;
float distance;
float Length;
float BMI;

void setup() {
  Serial.begin(9600);
  Serial.println("ready to read and please ensure the weight more than 1 Kg");
  pinMode(8, OUTPUT);
  pinMode(9, INPUT);

  scale.set_scale(calibration_factor);
  scale.tare();  //Reset the scale to 0
}
void loop(){

  Serial.print("Reading: ");
  units = scale.get_units(10), 2;
  //units = (units*0.454)-0.02;
  //Serial.print(units);
  if (units < 0)
  {
    units = 0.00;

  }
  else{
    units = ((units*0.454)-0.02)/2;

  }

  digitalWrite(8, LOW);
  delayMicroseconds(2);
  digitalWrite(8, HIGH);
  delayMicroseconds(10);
  digitalWrite(8, LOW);
  duration = pulseIn(9, HIGH);
  distance = duration*0.0343/2;
```

```
  Length =  ((180 - distance)/100);

  BMI= (units/(Length*Length));

  Serial.print("Length: ");
  Serial.print(Length);
  Serial.print("m");
  Serial.println();
  Serial.print("weight: ");
  Serial.print(units);
  Serial.print(" KG");
  Serial.println();
  Serial.print("BMI: ");
  Serial.print(BMI);
  Serial.println();
  delay(1000);

if(BMI<=18.4){
    Serial.println("You are in Underweight");
    Serial.println("A healthy diat chart for you");
    Serial.println("1. Eat more often.");
    Serial.println("2. Drink Milk.");
    Serial.println("3. Get Quality Sleep");
    Serial.println("4. Eat Fruits.");
    }

else if  (BMI>14.4 && BMI<=24.9){
    Serial.println("You are Healthy");
    Serial.println("A healthy diat chart for you");
    Serial.println("1. Eat healthy food");
    Serial.println("2. Drink Water");
    Serial.println("3. Drink Milk");
    Serial.println("4. Eat more Vegetables");
}

else if (BMI>=25.0 && BMI<=29.9){
    Serial.println("You are Overweight");
    Serial.println("A healthy diat chart for you");
    Serial.println("1. Eat high fibre foods");
    Serial.println("2. Do not stock junk food");
    Serial.println("3. Plan your meals");
    Serial.println("4. Cut down on alcohol");
}

else if(BMI>=30){
    Serial.println("You are Obsee");
```

```
    Serial.println("A healthy diat chart for you");
    Serial.println("1. Eat more vegetables - add them at every meal.");
    Serial.println("2. Try eating off smaller plates so as to eat smaller portions");
    Serial.println("3. Choose minimally processed, whole foods");
    Serial.println("4. Drink water or other beverages that are naturally calorie-free");
          }
}
```