This code needs the raspberry pi 3 hardware to execute

```
from ABE_ADCPi import ADCPi  #Import ADCPi library to use the ADC Pi
from ABE_helpers import ABEHelpers  #import the helper class
import time #import the library to use delay in code
import smbus

from flask import Flask, render_template # to import the flask library
with the render_template inside it
app = Flask(__name__, template_folder='/home/pi/testing') # create a flask
object called app and direct it to the mentioned distention where all the
files of the code will at the same directory level


# setting up the ADC
i2c_helper=ABEHelpers()
bus=i2c_helper.get_smbus()#initialize sumbs using i2c_helper object
adc=ADCPi (bus, 0x68,0x69)#initialize the ADC device using default address
& sample rate
adc.set_bit_rate(12)# set bit rate to 12
adc.set_conversion_mode(1)#set continuous conversion mode by sending 1
time.sleep(0.2)


#Potential meter
def getPotentiometerInvoltage1():
    return(adc.read_voltage(2))#reads voltage value form selected channel
2 on the raspberry pi, range between 0v-5v

def getPotentiometerInvoltage2():
    return(adc.read_voltage(3)) ))#reads voltage value form selected
channel 3 on the raspberry pi, range between 0v-5v

def getPotentiometerInvoltage3():
    return(adc.read_voltage(1)) ))#reads voltage value form selected
channel 1 on the raspberry pi, range between 0v-5v

@app.route('/') #Run the code below this function when someone accesses
the root URL ('/') or default web page of the server, navigate to
http://0.0.0.0:5090
def home():
        return render_template('Main_3.html', title='Test Page') #Send a
static HTML home page to the client's web browser

@app.route('/power') #Run the code below this function when someone
accesses the root URL ('/power') of the server, navigate to
http://0.0.0.0:5090
def power():
        return render_template('Electricity_3.html', title='Test Page')
#Send a static HTML Electricity page to the client's web browser

@app.route('/water') #Run the code below this function when someone
```

This code needs the raspberry pi 3 hardware to execute

```
accesses the root URL (‘/water) of the server, navigate to
http://0.0.0.0:5090
def water():
        return render_template('Water&Gas_3.html', title='Test Page')
#Send a static HTML water & gas page to the client's web browser
#@app.route('/consumption') #Run the code below this function when someone
accesses the root URL (‘/consumption) of the server, navigate to
http://0.0.0.0:5090
#def consumption():

@app.route('/consumption')
def Consumption():#Send a dynamic HTML page to print the values of the
consumptions (after billing) the client's web browser
    potentiometerVoltage1=getPotentiometerInvoltage1()#copying the return
value of the functions and saves them in a string, this string will have
the mv output of the power meter
    potentiometerVoltage2=getPotentiometerInvoltage2()#copying the return
value of the functions and saves them in a string, this string will have
the mv output of the water meter
    potentiometerVoltage3=getPotentiometerInvoltage3()()#copying the
return value of the functions and saves them in a string, this string will
have the mv output of the gas meter



    water = (potentiometerVoltage2 / 0.015) * 0.04 #the water parameter
will have the converted mv value to Gallon
    power = (potentiometerVoltage1 / 0.010) * 0.23 #the power parameter
will have the converted mv value to kw/h
    gas = (potentiometerVoltage3 / 0.020) * 2.90 #the gas parameter will
have the converted mv value to cubic feet

    WaterFuelCharge = (potentiometerVoltage2 / 0.015) * 0.04 #the
parameter will have the fuel charge of water according to the consumption
(mv)
    PowerFuelCharge = (potentiometerVoltage1 / 0.010) * 0.01 #the
parameter will have the fuel charge of power according to the consumption
(mv)

    totPower = power + PowerFuelCharge #the total power consumption will
be calculated as the addition of the charges and the consumption
    totWater = water + WaterFuelCharge +gas #the water total cost will be
the water consumption added with the Fuel charges and the gas

    Bill =  totWater+ totPower # total bill will include all the charges
on the user

    author = "IOT-BASED SMART UTILITY METER WEBSITE" #the HTML page title
    return render_template('test1.html', author=author,   power=power,
water=water, gas=gas, PowerFuelCharge=PowerFuelCharge ,
WaterFuelCharge=WaterFuelCharge, totPower=
totPower,totWater=totWater,Bill=Bill)# here we are sending each value to
the corresponding place on the Dynamic HTML page.

if __name__=='__main__': #If this script was run directly from the command
```

This code needs the raspberry pi 3 hardware to execute

```
line
    app.run(debug=True, host='0.0.0.0', port=5090) #Have the server listen on port 5090 and report any errors. The addition of 0.0.0.0 implies that the web server is going to listen on all network devices, so the web site can be browsed from anywhere on the same local network
```

HTML Pages

Home Page

```
<html lang="en-AE">
<head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
 <style>
.flex-container {
   display: -webkit-flex;
   display: flex;
   -webkit-flex-flow: row wrap;
   flex-flow: row wrap;
   text-align: center;
}

.flex-container > * {
   padding: 15px;
   -webkit-flex: 1 100%;
   flex: 1 100%;
}

.article {
   text-align: left;
}

header {background: black;color:white;}
footer {background: #aaa;color:white;}
.nav {background:#eee;}

.nav ul {
   list-style-type: none;
 padding: 0;
}

.nav ul a {
 text-decoration: none;
}

@media all and (min-width: 768px) {
    .nav {text-align:left;-webkit-flex: 1 auto;flex:1 auto;-webkit-order:1;order:1;}
    .article {-webkit-flex:5 0px;flex:5 0px;-webkit-order:2;order:2;}
    footer {-webkit-order:3;order:3;}
}
p  {
 font-family:Calibri Light;
}
h1  {
 font-family:Calibri Light;
}
li {
list-style: none;
float:left;
font-size: 30px;
font-family:Calibri Light;
margin-left: 15px;
padding-top: 10px;
}
</style>
</head>
<body>

<div class="flex-container">
<header>
  <h1>IOT-BASED SMART UTILITY METER</h1>
</header>

<nav class="nav">
<ul>
<li><a
href="http://www.w3schools.com/html/tryit.asp?filename=tryhtml_layout_flexbox">Home</a>
</li>
  <li><a
href="http://www.w3schools.com/html/tryit.asp?filename=tryhtml_links_w3schools">Electricity
</a></li>
  <li><a
href="http://www.w3schools.com/html/tryit.asp?filename=tryhtml_layout_flexbox">Water and
Natural Gas</a></li>
</ul>
</nav>
```

This code needs the raspberry pi 3 hardware to execute

```
<article class="article">
  <h1>Power, Water and Gas Orgnizations</h1>
  <p>The three important utility meters in each house presenst; power, water and gas. They are discrete and installed in various residential, industrial and commercial sectors. Most of them, are not engaged to any mean of communication that enables the utility to manage their consumption. All the current methods of connecting or disconnecting are done manually. However, the main objective of Power, Water ans Gas Orgnizations is providing the fastest, most effcient and the most practicle methods. </p>
  <p>To provide such services, Smart metering is proposed to calculate customrs bills and to control the switching On/Off utilities throught the internet. This communication will decrease the manual operations that might hold large error percentages. </p>

<p>In our simplified demonistration, we will read three Potentioal meters for Power, Water and Natural Gas. Hence, we will convert the number of pulses that should represent (kw/h, Cubic feet and Gallons) by voltages. </p>

</article>

<footer>Copyright © AUS.edu</footer>
</div>

</body>
</htm>
```

Water and Gas Page

```
<html lang="en-AE">
<head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
  <style>
.flex-container {
    display: -webkit-flex;
    display: flex;
    -webkit-flex-flow: row wrap;
    flex-flow: row wrap;
    text-align: center;
}

.flex-container > * {
    padding: 15px;
    -webkit-flex: 1 100%;
    flex: 1 100%;
}

.article {
    text-align: left;
```

This code needs the raspberry pi 3 hardware to execute

```
}

header {background: black;color:white;}
footer {background: #aaa;color:white;}
.nav {background:#eee;}

.nav ul {
    list-style-type: none;
 padding: 0;
}

.nav ul a {
 text-decoration: none;
}

@media all and (min-width: 768px) {
    .nav {text-align:left;-webkit-flex: 1 auto;flex:1 auto;-webkit-
order:1;order:1;}
    .article {-webkit-flex:5 0px;flex:5 0px;-webkit-order:2;order:2;}
    footer {-webkit-order:3;order:3;}
}
p  {
 font-family:Calibri Light;
}
h1  {
 font-family:Calibri Light;
}
li {
list-style: none;
float:left;
font-size: 30px;
font-family:Calibri Light;
margin-left: 15px;
padding-top: 10px;
}
</style>
</head>
<body>

<div class="flex-container">
<header>
  <h1>IOT-BASED SMART UTILITY METER                        </h1>
</header>

<nav class="nav">
<ul>
<li><a href="https://www.google.ae/_/chrome/newtab?espv=2&amp;ie=UTF-
8#">Home</a></li>
  <li><a
href="http://www.w3schools.com/css/tryit.asp?filename=trycss_default">Electri
city</a></li>
  <li><a href="https://www.google.ae/_/chrome/newtab?espv=2&amp;ie=UTF-
8#">Water and Natural Gas</a></li>

</ul>
</nav>
```

This code needs the raspberry pi 3 hardware to execute

```
<article class="article">
  <h1>Water and Natural Gas</h1>
  <p>According to Dubai Electricity and Power Authority, each 1 IG (Imperial
Gallon) costs 0.04 fills. There are in addition to the power consumption a
Fuel charges. For each 1kwh it cost 0.01 fills.</p>

<p>And for Gas Consumption, we will consider each 1 Therm (that is eqaul t0
100 cubic feet) to cost 2.90 AED according to national standerds. With no
additional feeses. </p>

<p> For Water, for each 15mv input it will represent 1 Gallon. Hence, for
each 15mv it will cost 0.04 fills. And, for each 15mv input, it will present
an 100 cubic feet of Natural Gas. So, 2.90 AED for each cubic feet </p>
</article>

<footer>Copyright © AUS.edu</footer>
</div>

</body>
</html>
```

Power Page

```
<html lang="en-AE">
<head><meta http-equiv="Content-Type" content="text/html; charset=UTF-8">
  <style>
.flex-container {
    display: -webkit-flex;
    display: flex;
    -webkit-flex-flow: row wrap;
    flex-flow: row wrap;
    text-align: center;
}

.flex-container > * {
    padding: 15px;
    -webkit-flex: 1 100%;
    flex: 1 100%;
}

.article {
    text-align: left;
}

header {background: black;color:white;}
footer {background: #aaa;color:white;}
.nav {background:#eee;}

.nav ul {
    list-style-type: none;
 padding: 0;
```

This code needs the raspberry pi 3 hardware to execute

```
}

.nav ul a {
 text-decoration: none;
}

@media all and (min-width: 768px) {
    .nav {text-align:left;-webkit-flex: 1 auto;flex:1 auto;-webkit-
order:1;order:1;}
    .article {-webkit-flex:5 0px;flex:5 0px;-webkit-order:2;order:2;}
    footer {-webkit-order:3;order:3;}
}
p  {
 font-family:Calibri Light;
}
h1  {
 font-family:Calibri Light;
}
li {
list-style: none;
float:left;
font-size: 30px;
font-family:Calibri Light;
margin-left: 15px;
padding-top: 10px;
}
</style>
</head>
<body>

<div class="flex-container">
<header>
  <h1>IOT-BASED SMART UTILITY METER                        </h1>
</header>

<nav class="nav">
<ul>
<li><a href="https://www.google.ae/_/chrome/newtab?espv=2&amp;ie=UTF-
8#">Home</a></li>
  <li><a
href="http://www.w3schools.com/css/tryit.asp?filename=trycss_default">Electri
city</a></li>
  <li><a href="https://www.google.ae/_/chrome/newtab?espv=2&amp;ie=UTF-
8#">Water and Natural Gas</a></li>

</ul>
</nav>

<article class="article">
  <h1>Electricity- Power</h1>
  <p>According to Dubai Electricity and Power Authority, each 1kwh (killo
what per hour) costs 0.23 fills. There are in addition to the power
consumption a Fuel charges. For each 1kwh it cost 0.07 fills.  </p>

<p> For Power, for each 20mv input it will represent 1 Kw/h. Hence, each 20mv
will cost 0.23 fills. </p>
```

```
</article>

<footer>Copyright © AUS.edu</footer>
</div>

</body>
</html>
```

Consumption Page

```
<html><!-- Copyright 2015 The Chromium Authors. All rights reserved.
     Use of this source code is governed by a BSD-style license that can be
     found in the LICENSE file. --><head><meta http-equiv="Content-Type" content="text/html;
charset=UTF-8">
<style>
.flex-container {
    display: -webkit-flex;
    display: flex;
    -webkit-flex-flow: row wrap;
    flex-flow: row wrap;
    text-align: center;
}

.flex-container > * {
    padding: 15px;
    -webkit-flex: 1 100%;
    flex: 1 100%;
}

.article {
    text-align: left;
}

header {background: black;color:white;}
footer {background: #aaa;color:white;}
.nav {background:#eee;}

.nav ul {
    list-style-type: none;
 padding: 0;
}

.nav ul a {
 text-decoration: none;
}
```

This code needs the raspberry pi 3 hardware to execute

```
@media all and (min-width: 768px) {
    .nav {text-align:left;-webkit-flex: 1 auto;flex:1 auto;-webkit-order:1;order:1;}
    .article {-webkit-flex:5 0px;flex:5 0px;-webkit-order:2;order:2;}
    footer {-webkit-order:3;order:3;}
}
p  {
 font-family:Calibri Light;
}
h1  {
 font-family:Calibri Light;
}
li {
list-style: none;
float:left;
font-size: 30px;
font-family:Calibri Light;
margin-left: 15px;
padding-top: 10px;
}
  table, td, th {
    border: 1px solid black;
}

table {
    border-collapse: collapse;
    width: 50%;
}

td {
    height: 50px;
    vertical-align: bottom;
  text-align: center;
}
  th {
  text-align: left;
  }

</style>
</head>
<body>


<div class="flex-container">
```

This code needs the raspberry pi 3 hardware to execute

```
<header>
  <h1>Utility meter Website</h1>
</header>

<nav class="nav">
<ul>
<li><a href="chrome-search://local-ntp/local-ntp.html#">Home</a></li>
  <li><a
href="http://www.w3schools.com/css/tryit.asp?filename=trycss_default">Electricity</a></li>
  <li><a href="chrome-search://local-ntp/local-ntp.html#">Water and Natural Gas</a></li>

</ul>
</nav>

</div>
  <h2> User Consumption Details </h2>
  <p> Consumption </p>
<table border="1">
    <tbody><tr>
      <td><b> Utility</b> </td>
      <td> <b>User Consumption</b> </td>
      </tr>
     <tr>
       <td>Electricity</td>
       <td> {{power}}</td>
      </tr>
     <tr>
       <td>Water</td>
       <td> {{water}}</td>
      </tr>
         <tr>
       <td>Gas</td>
       <td> {{gas}}</td>
      </tr>

      </tbody></table>
  <p> The Fual charges</p>

  <table border="1">

        <tbody><tr>
          <td> <b>Electricity Fual Charges</b> </td>
       <td> {{PowerFuelCharge}}</td>
      </tr>
```

This code needs the raspberry pi 3 hardware to execute

```
     <tr>
       <td><b>Water Fuel Charges</b></td>
       <td> {{WaterFuelCharge}}</td>
      </tr>
  </tbody></table>

  <p> Summary </p>

<table border="1">
    <tbody>
      <tr>
        <td><b> Electricity</b></td>
       <td> {{totPower}}</td>
      </tr>
     <tr>
       <td><b>Water</b></td>
       <td> {{totWater}}</td>
      </tr>
         <tr>
           <td><b>Total Bill(AED)</b></td>
       <td> {{Bill}}</td>
      </tr>

      </tbody></table>
  <br>

<footer>Copyright © AUS.edu</footer>

  </body></html>
```