



# CEIS101 COURSE PROJECT SMART HOME AUTOMATION AND SECURITY SYSTEM

Presented by: Deven Williams



# INTRODUCTION

This six-part course project fundamentally addresses skills required to integrate hardware, software, and networks into a complete system. The end state produces an IoT device capable of simulating smart home automation and home security. An IoT Tech Core Kit was used for the hardware and component requirements. The prototype was developed utilizing an online 3D modeling program called Tinkercad. The programming was executed using an open-source electronic platform called Arduino IDE. The device offers varying features designed to equip the user with home monitoring and security. Some of these features include distance monitoring with intruder alerts, open/closed door alerts and security light automation for night time protection.

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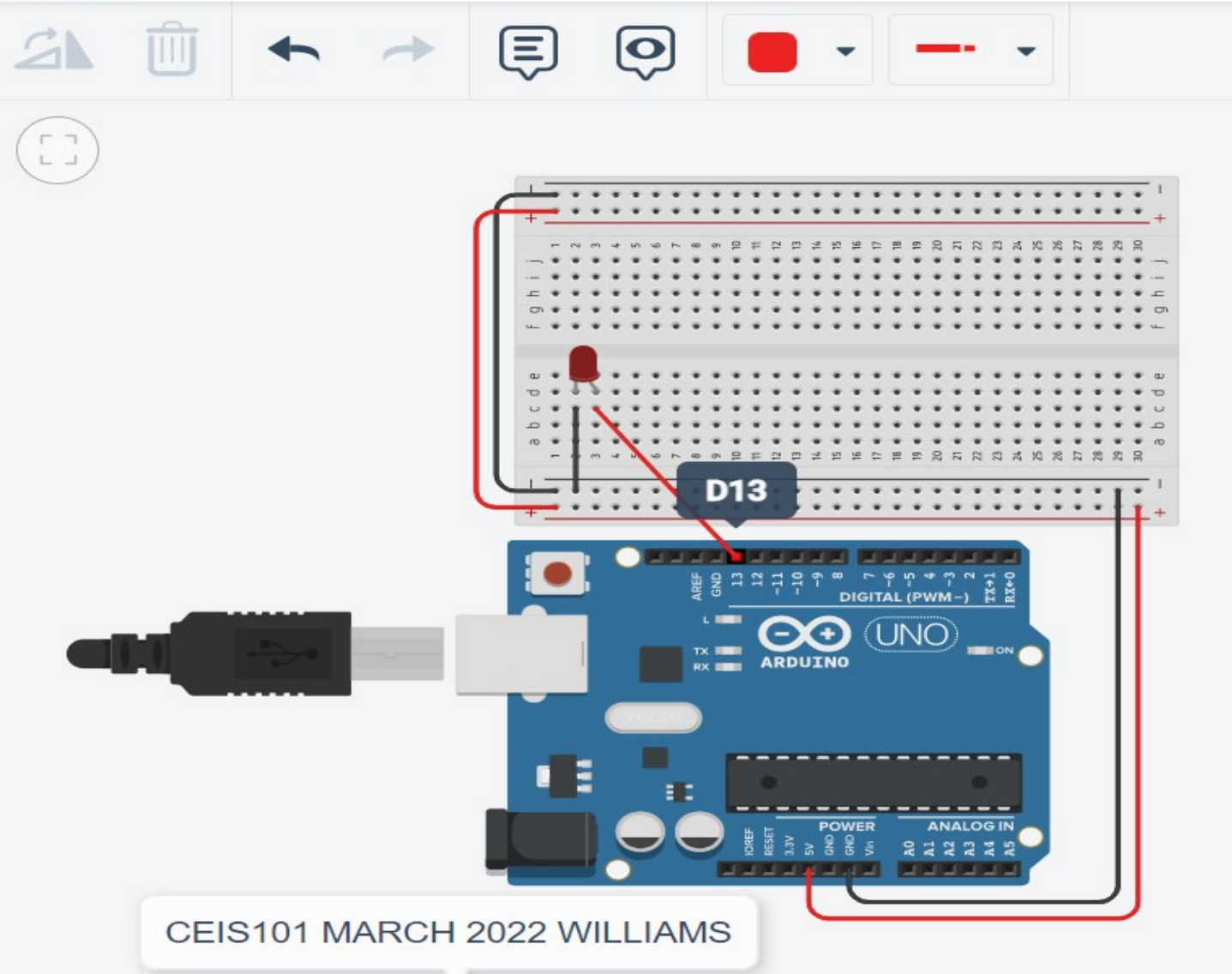
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```

# CIRCUIT SIMULATION IN TINKERCAD

# CIRCUIT (SCREENSHOT) BLINKING LED LIGHT



CEIS101 Module 2 Project



# CODE (SCREENSHOT) BLINKING LED LIGHT

title block comment CEIS101 MARCH 2022 WILLIAMS

set pin 13 to HIGH

wait 1 secs

set pin 13 to LOW

wait 1 secs

```
1 // C++ code
2 //
3 /*
4    CEIS101 MARCH 2022 WILLIAMS
5 */
6
7 void setup()
8 {
9     pinMode(13, OUTPUT);
10 }
11
12 void loop()
13 {
14     digitalWrite(13, HIGH);
15     delay(1000); // Wait for 1000 millisecond(s)
16     digitalWrite(13, LOW);
17     delay(1000); // Wait for 1000 millisecond(s)
18 }
```

```
charset="<?php bloginfo( 'charset' ); ?>" />
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rel="profile" href="http://gmpg.org/xfn/11" />
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```

# INVENTORY OF PARTS, CIRCUIT BUILDING AND DISPLAYING MESSAGES

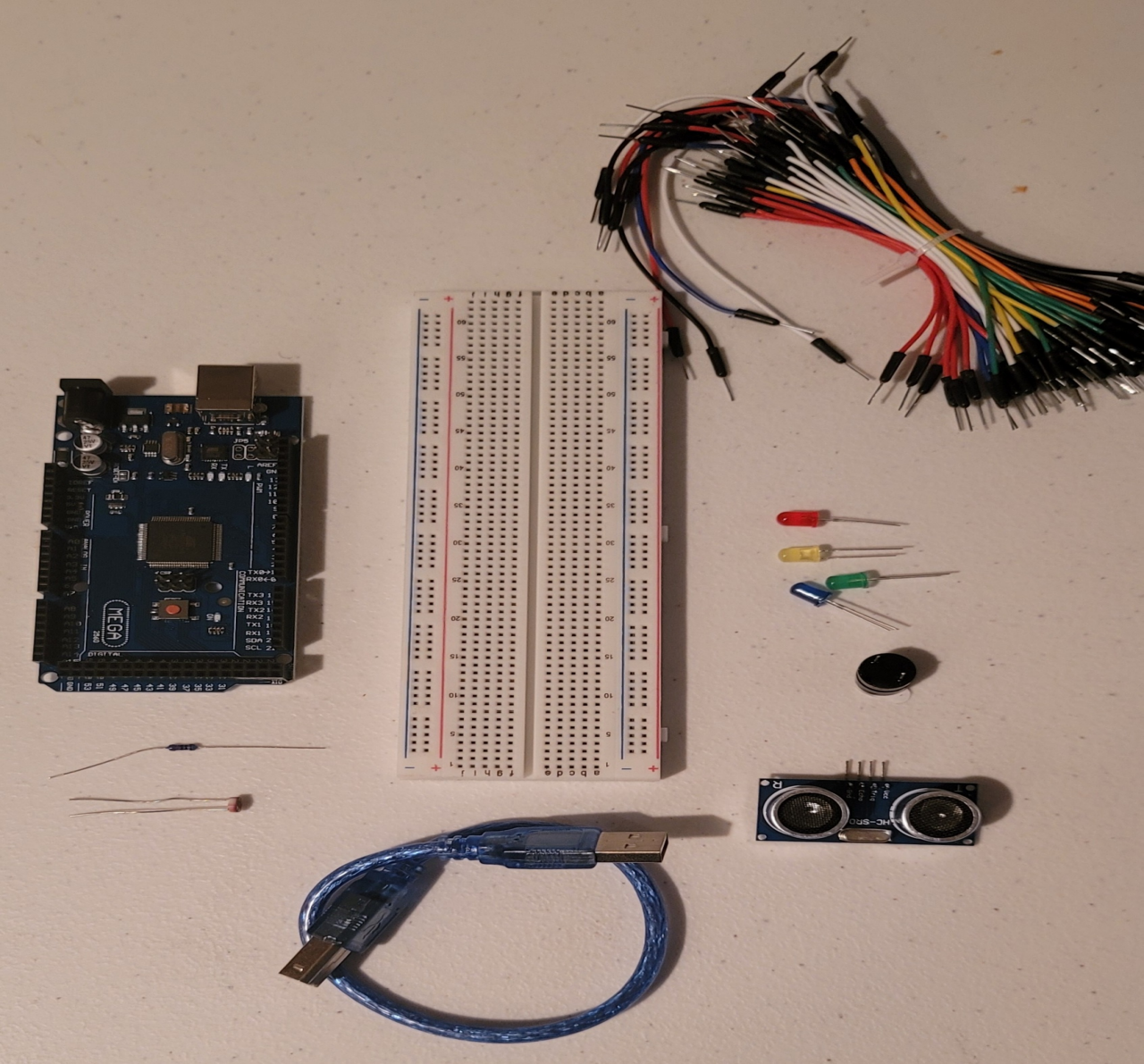
# INVENTORY OF IOT KIT (PICTURE)

- UCTRONICS Kit
- ESP32 (2)
- LCD Modules (2)
- Breadboards (3)
- Mini Router
- Patch Cable
- Digital Multi Meter
- USB to Micro USB (2)



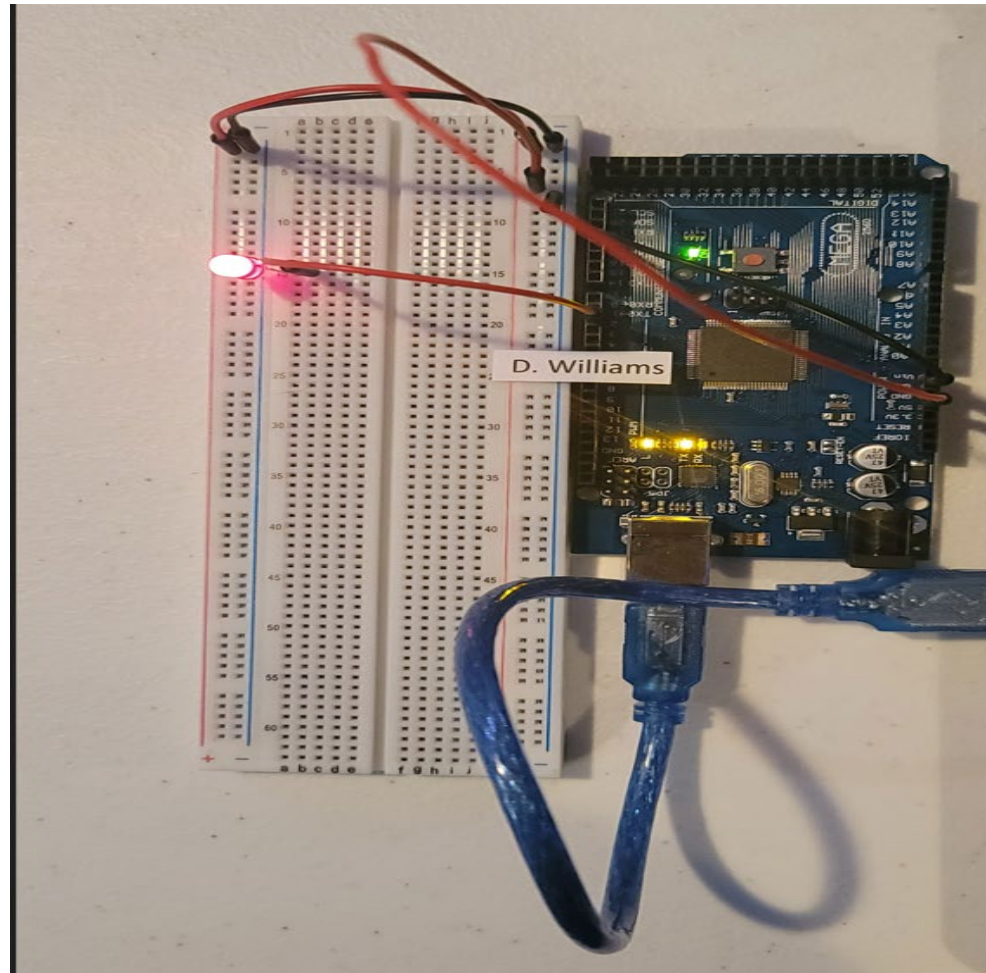
# ORGANIZATION OF PROJECT COMPONENTS (PICTURE)

- Arduino Mega 2560
- Breadboard
- Resistor 10k $\Omega$
- LEDs
- Ultrasonic Sensor
- Active Buzzer
- Photoresistor
- Wires
- USB Type B cable





# CIRCUIT WITH RED LED ON (PICTURE)

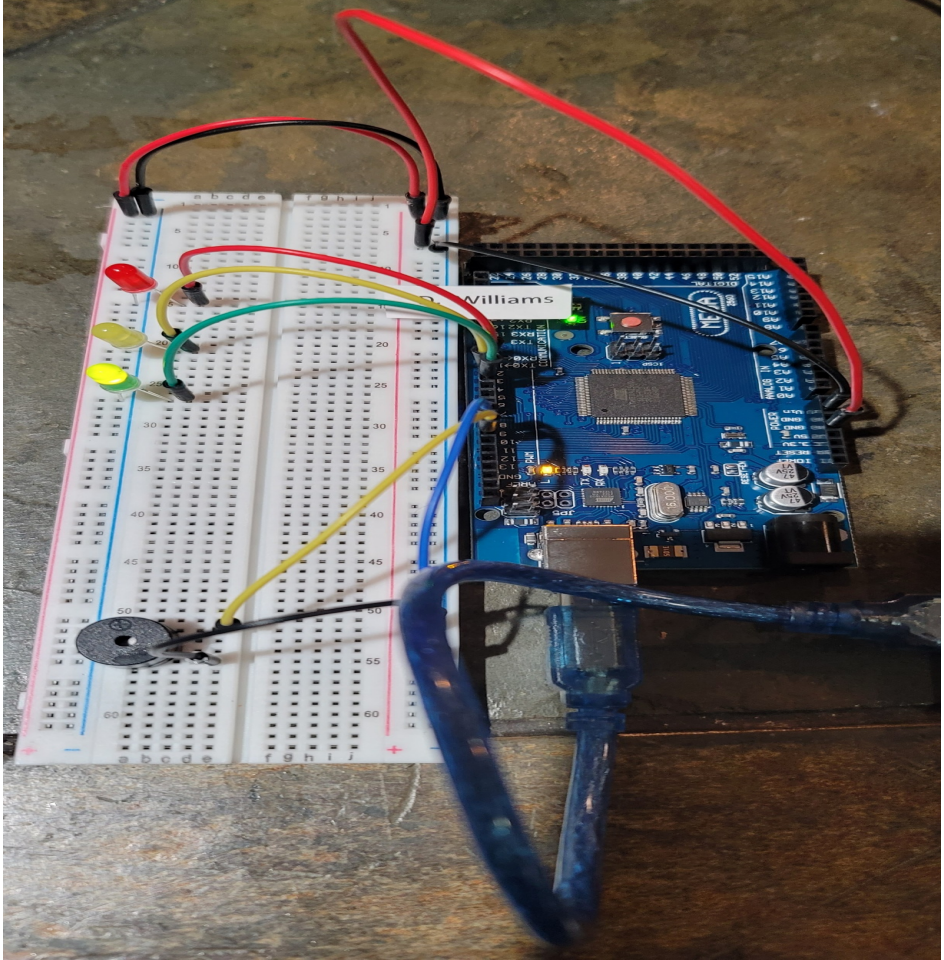




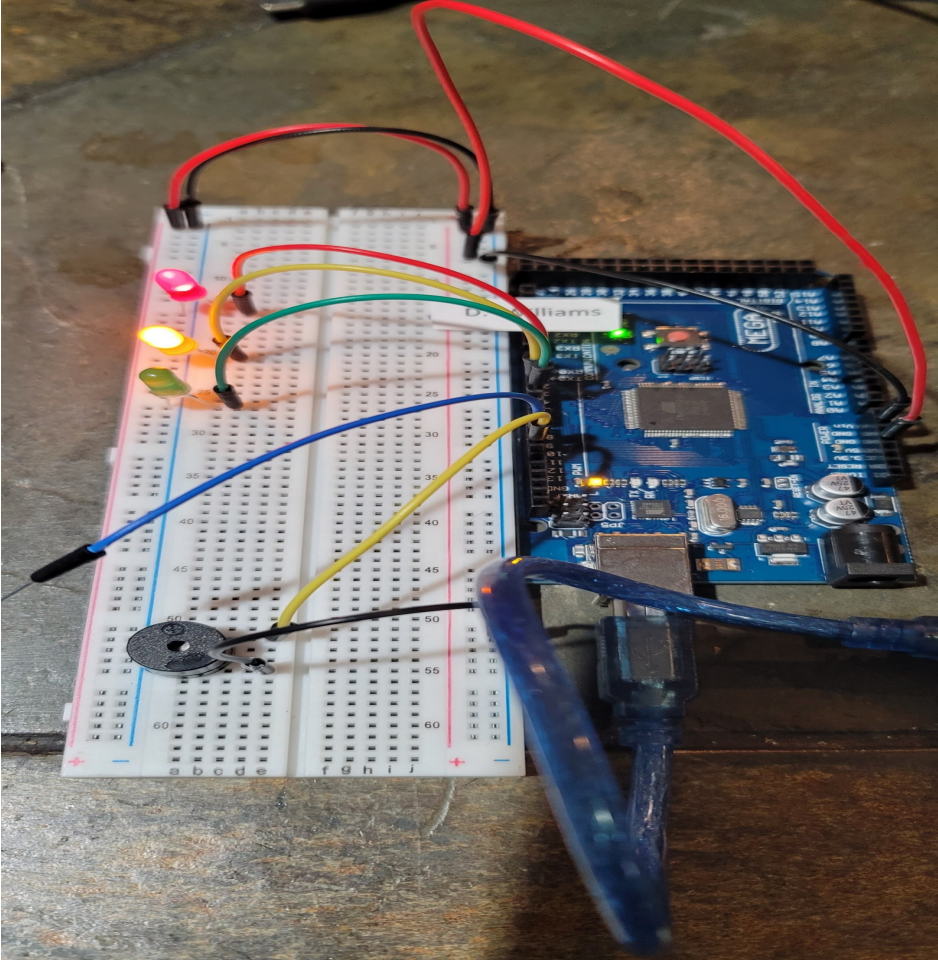
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```

# ADDING DOOR SENSOR TO SMART HOME SYSTEM

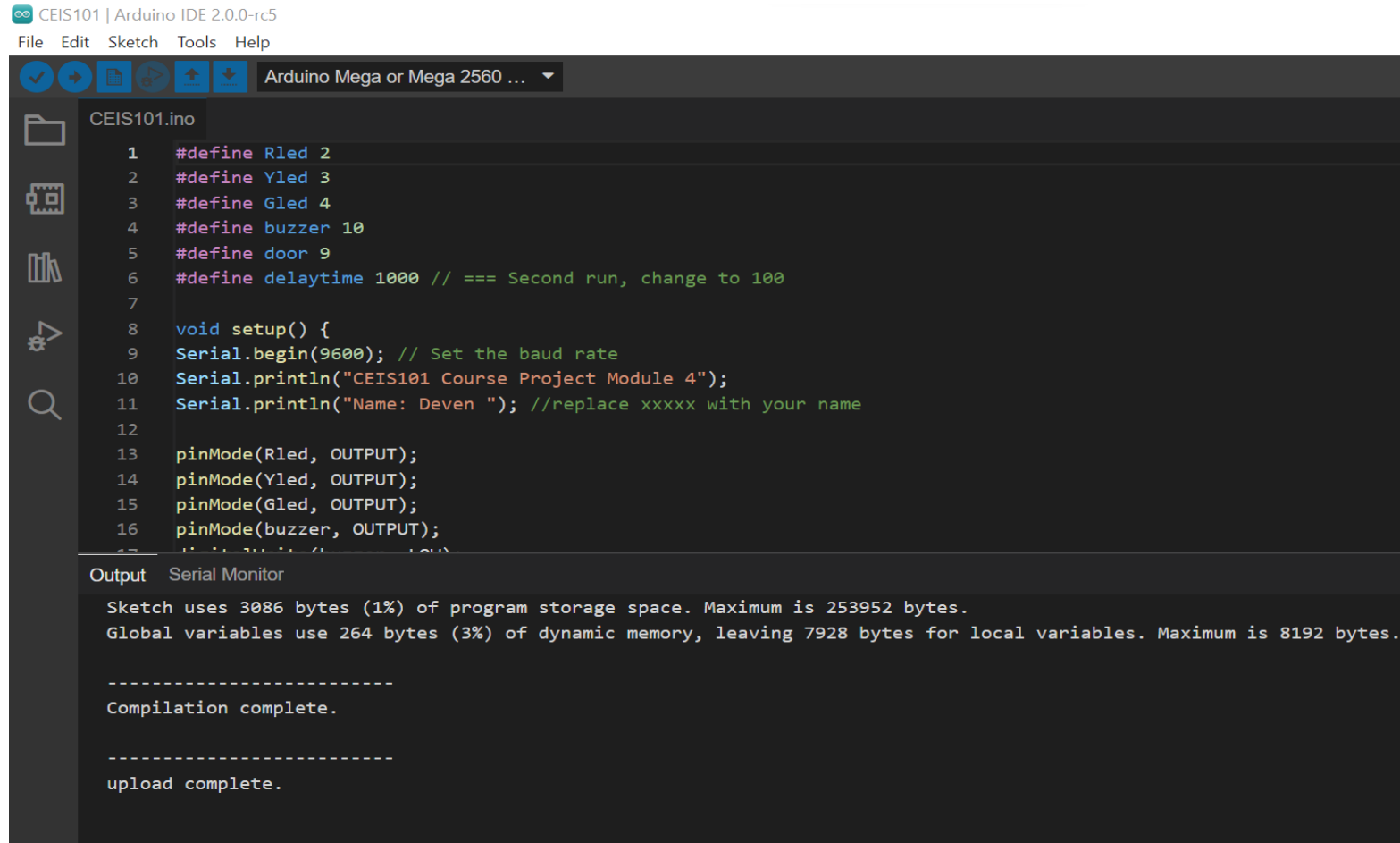
# CIRCUIT OF DOOR CLOSED WITH GREEN LED ON (PICTURE)



# CIRCUIT OF DOOR OPEN WITH GREEN LED OFF (PICTURE)



# ARDUINO CODE (SCREENSHOT) 1 OF 3



The screenshot displays the Arduino IDE interface. The top bar shows the project name "CEIS101 | Arduino IDE 2.0.0-rc5" and a menu with "File", "Edit", "Sketch", "Tools", and "Help". Below the menu is a toolbar with icons for file operations and a dropdown menu set to "Arduino Mega or Mega 2560 ...". The main editor window shows the file "CEIS101.ino" with the following code:

```
1  #define Rled 2
2  #define Yled 3
3  #define Gled 4
4  #define buzzer 10
5  #define door 9
6  #define delaytime 1000 // === Second run, change to 100
7
8  void setup() {
9  Serial.begin(9600); // Set the baud rate
10 Serial.println("CEIS101 Course Project Module 4");
11 Serial.println("Name: Deven "); //replace xxxxx with your name
12
13 pinMode(Rled, OUTPUT);
14 pinMode(Yled, OUTPUT);
15 pinMode(Gled, OUTPUT);
16 pinMode(buzzer, OUTPUT);
17 pinMode(door, OUTPUT);
```

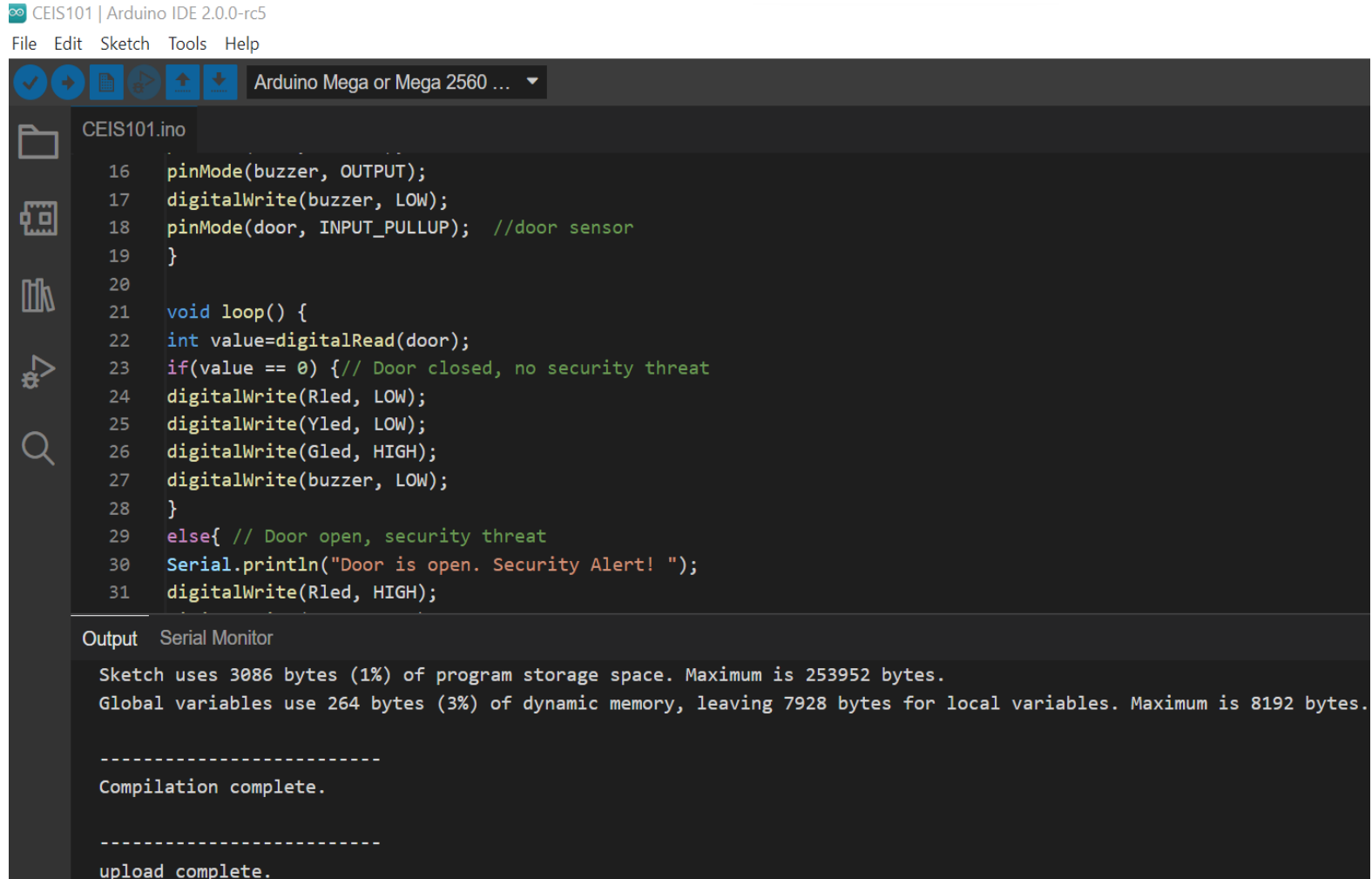
The bottom panel shows the "Output" window with the following text:

```
Serial Monitor
Sketch uses 3086 bytes (1%) of program storage space. Maximum is 253952 bytes.
Global variables use 264 bytes (3%) of dynamic memory, leaving 7928 bytes for local variables. Maximum is 8192 bytes.

-----
Compilation complete.

-----
upload complete.
```

# ARDUINO CODE (SCREENSHOT) 2 OF 3



The screenshot displays the Arduino IDE 2.0.0-rc5 interface. The top menu bar includes File, Edit, Sketch, Tools, and Help. The toolbar shows various icons for file operations and execution. The main editor window displays the code for CEIS101.ino, which is configured for an Arduino Mega or Mega 2560. The code defines a buzzer pin as an output and a door pin as an input with a pullup resistor. The loop function checks the door sensor; if it is closed (value == 0), it turns off the LEDs and the buzzer. If the door is open (value != 0), it prints a security alert to the serial monitor and turns on the red LED and buzzer.

```
CEIS101.ino
16 pinMode(buzzer, OUTPUT);
17 digitalWrite(buzzer, LOW);
18 pinMode(door, INPUT_PULLUP); //door sensor
19 }
20
21 void loop() {
22   int value=digitalRead(door);
23   if(value == 0) { // Door closed, no security threat
24     digitalWrite(Rled, LOW);
25     digitalWrite(Yled, LOW);
26     digitalWrite(Gled, HIGH);
27     digitalWrite(buzzer, LOW);
28   }
29   else{ // Door open, security threat
30     Serial.println("Door is open. Security Alert! ");
31     digitalWrite(Rled, HIGH);
```

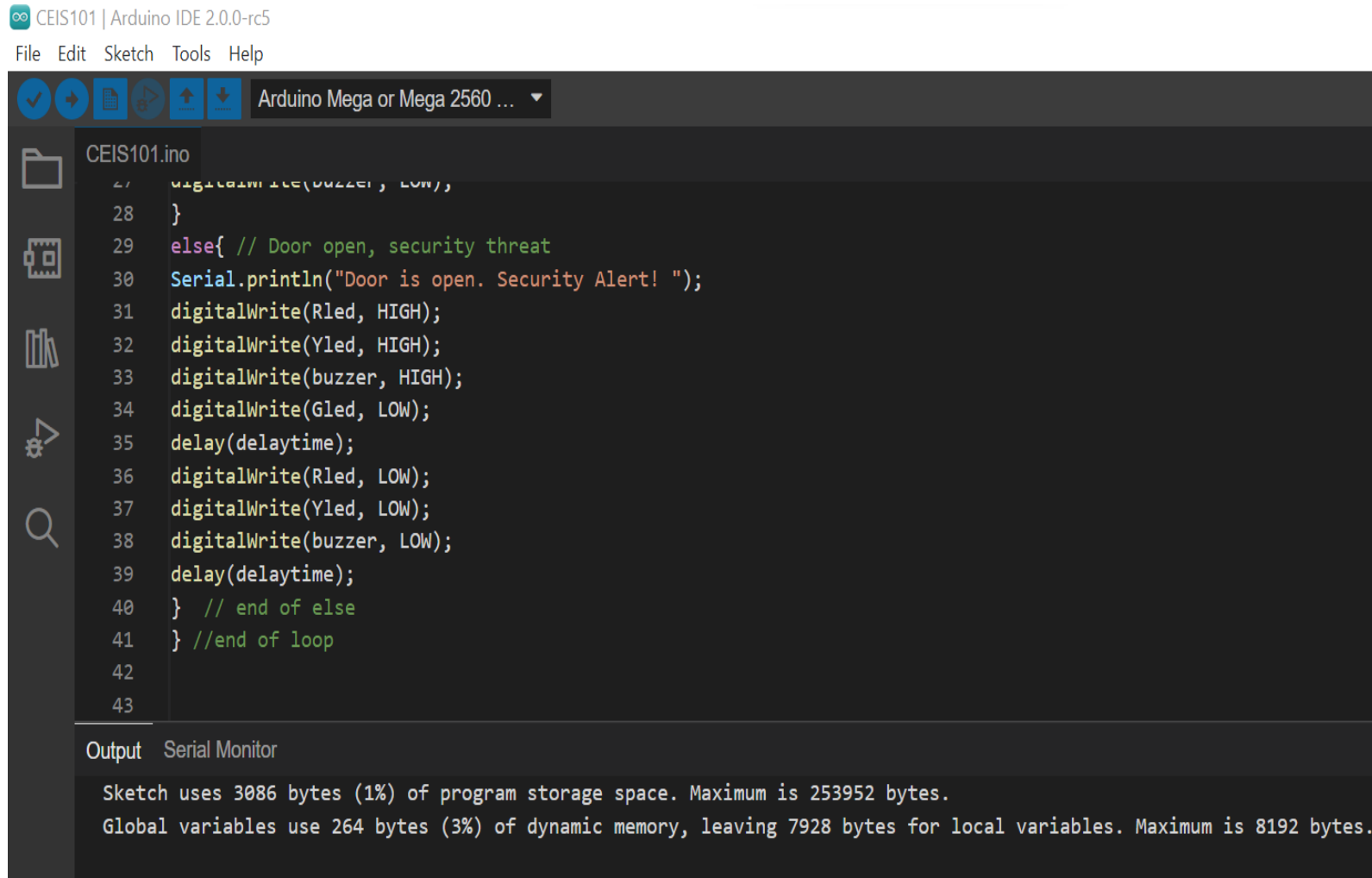
Output Serial Monitor

```
Sketch uses 3086 bytes (1%) of program storage space. Maximum is 253952 bytes.
Global variables use 264 bytes (3%) of dynamic memory, leaving 7928 bytes for local variables. Maximum is 8192 bytes.

-----
Compilation complete.

-----
upload complete.
```

# ARDUINO CODE (SCREENSHOT) 3 OF 3



CEIS101 | Arduino IDE 2.0.0-rc5  
File Edit Sketch Tools Help

Arduino Mega or Mega 2560 ...

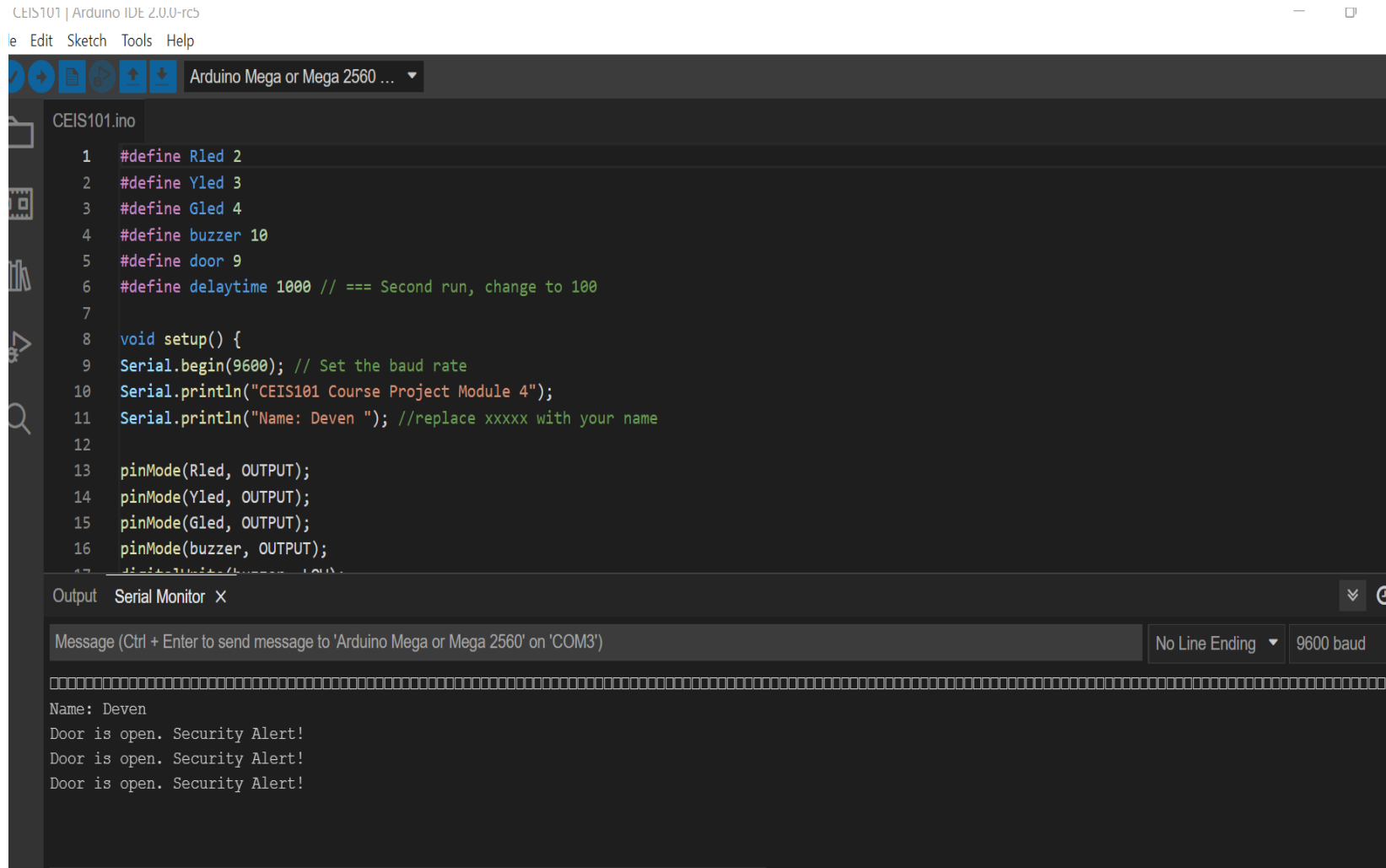
```
CEIS101.ino
27 digitalWrite(buzzer, LOW);
28 }
29 else{ // Door open, security threat
30 Serial.println("Door is open. Security Alert! ");
31 digitalWrite(Rled, HIGH);
32 digitalWrite(Yled, HIGH);
33 digitalWrite(buzzer, HIGH);
34 digitalWrite(Gled, LOW);
35 delay(delaytime);
36 digitalWrite(Rled, LOW);
37 digitalWrite(Yled, LOW);
38 digitalWrite(buzzer, LOW);
39 delay(delaytime);
40 } // end of else
41 } //end of loop
42
43
```

Output Serial Monitor

Sketch uses 3086 bytes (1%) of program storage space. Maximum is 253952 bytes.  
Global variables use 264 bytes (3%) of dynamic memory, leaving 7928 bytes for local variables. Maximum is 8192 bytes.



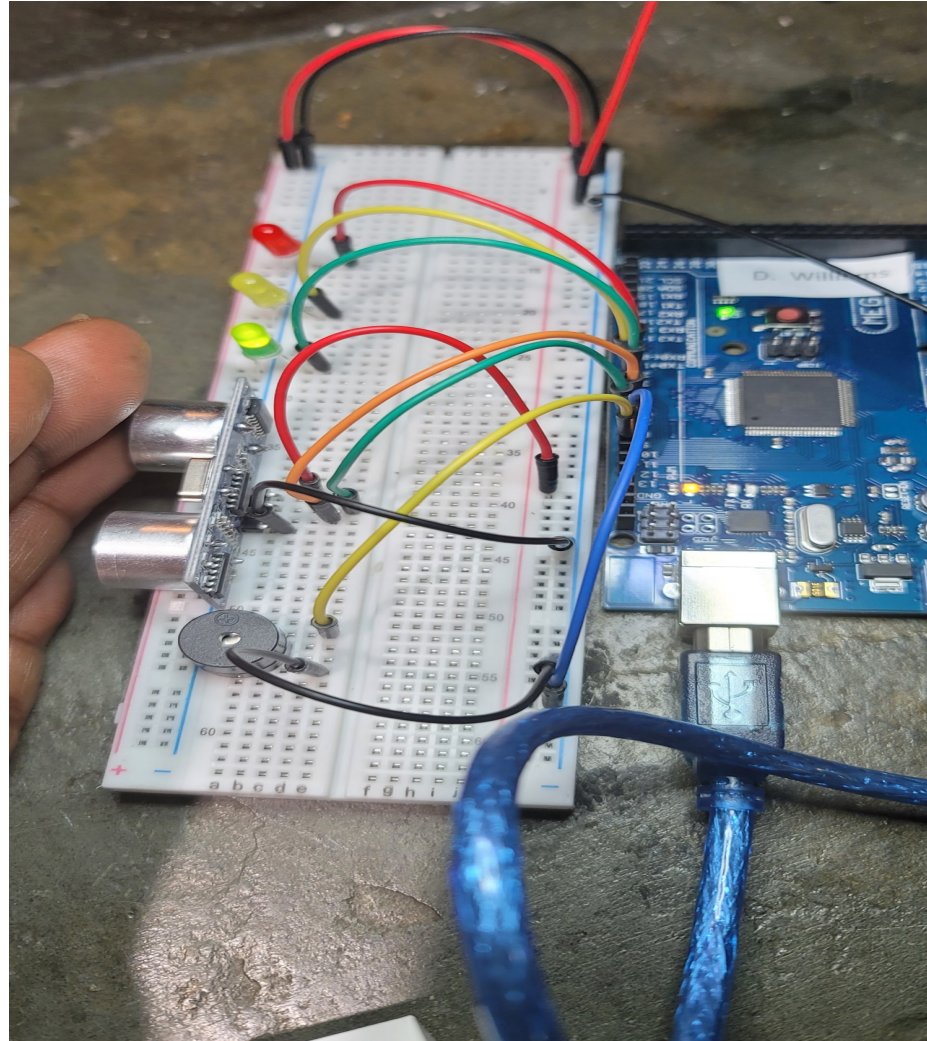
# SERIAL MONITOR (SCREENSHOT)



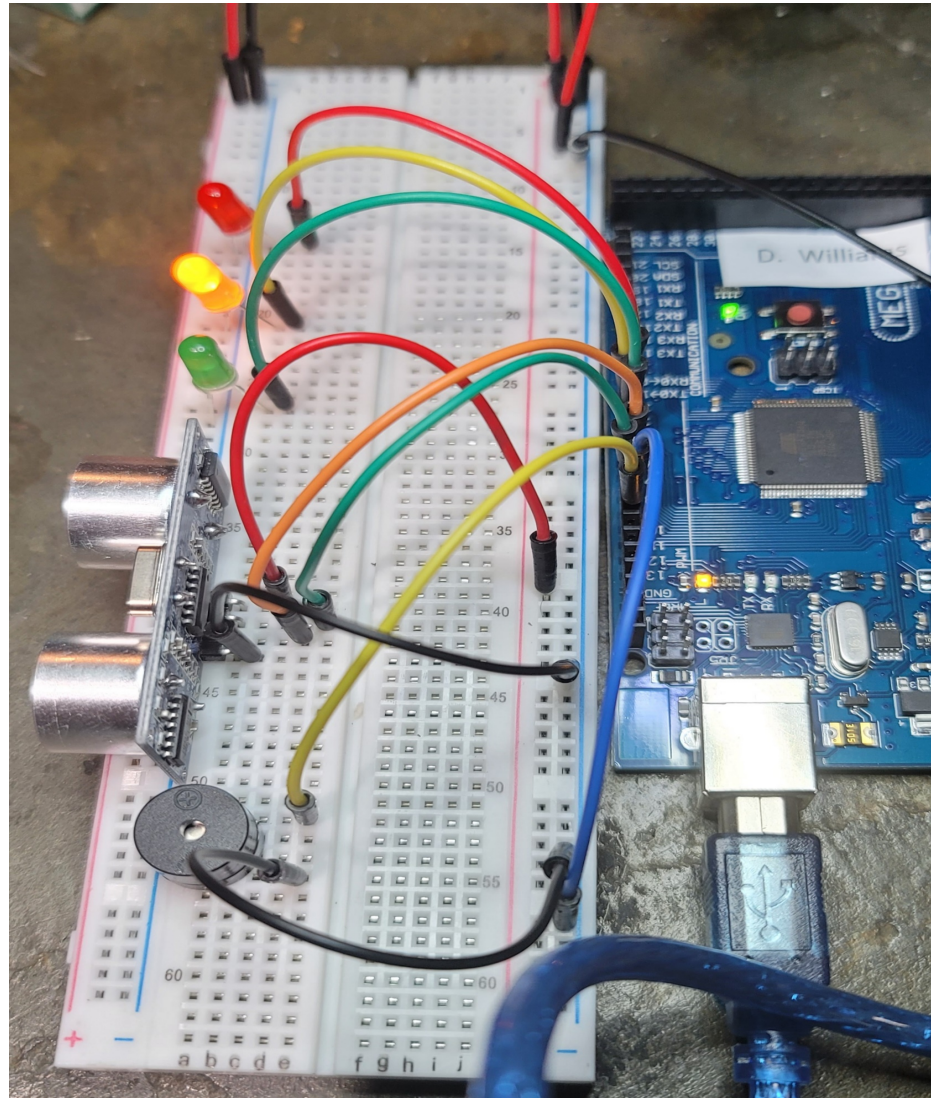
```
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responsive_menu_type = fruitful_get_class($responsive_menu_type);
```

# ADDING DISTANCE SENSOR TO SMART HOME SYSTEM AND CONDUCT DATA ANALYSIS

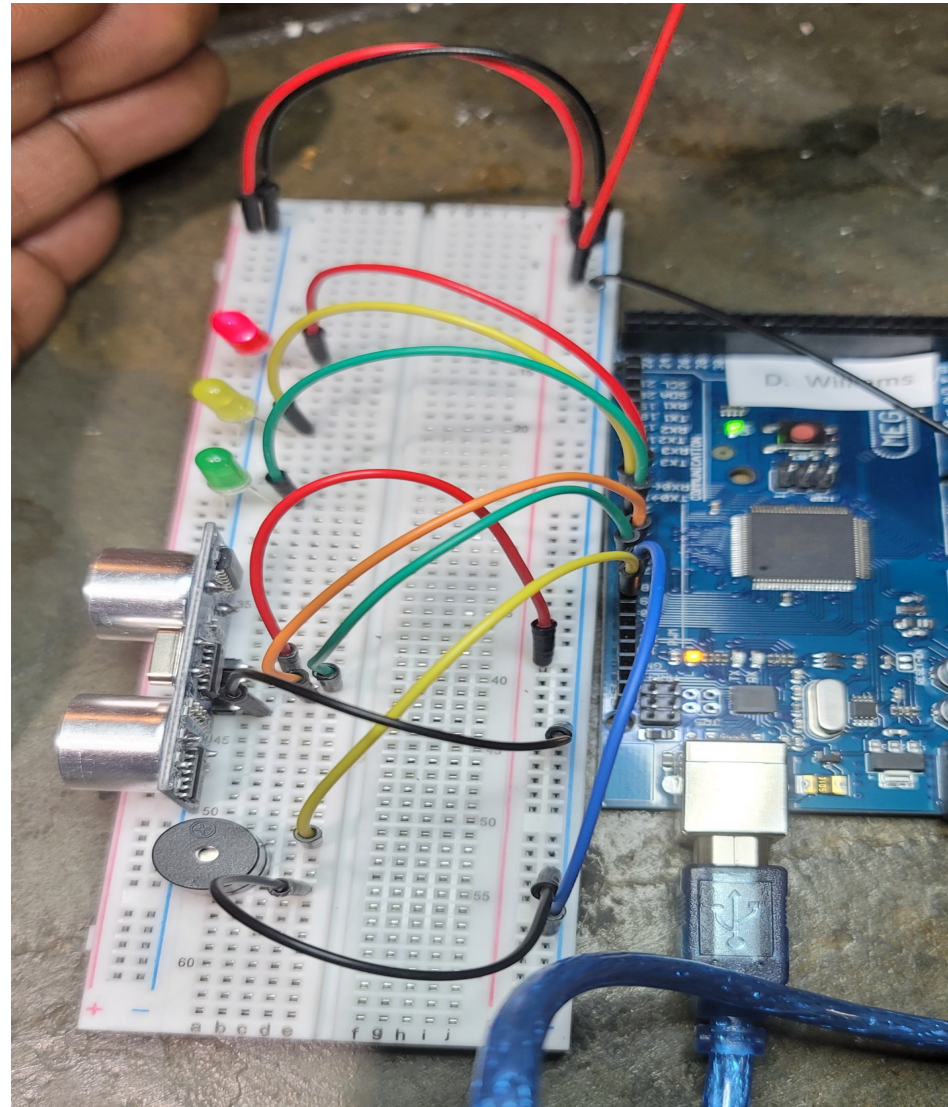
# CIRCUIT WITH GREEN LED ON (PICTURE)



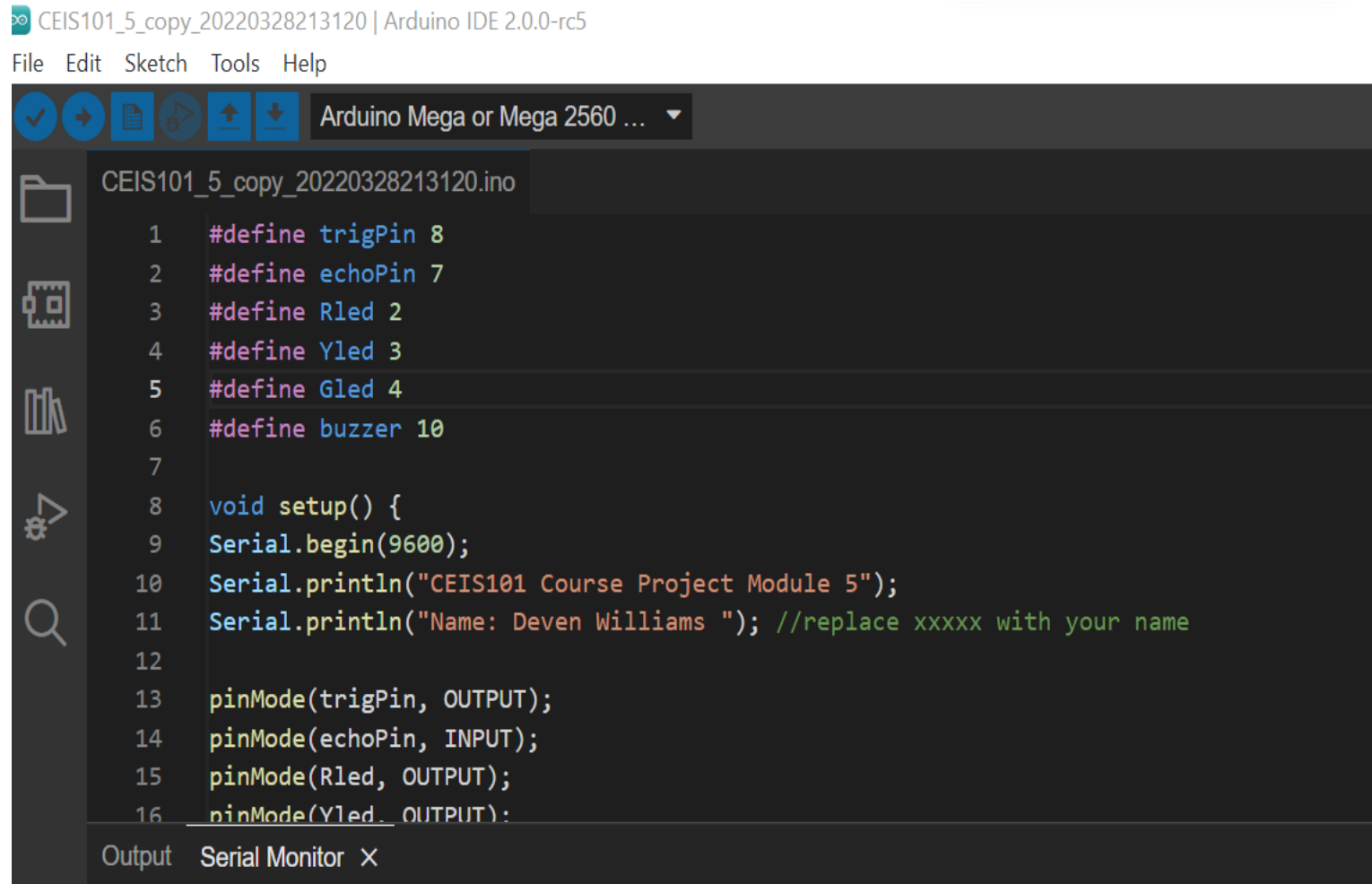
# CIRCUIT WITH YELLOW LED ON (PICTURE)



# CIRCUIT WITH RED LED ON (PICTURE)



# ARDUINO CODE (SCREENSHOT)



CEIS101\_5\_copy\_20220328213120 | Arduino IDE 2.0.0-rc5

File Edit Sketch Tools Help

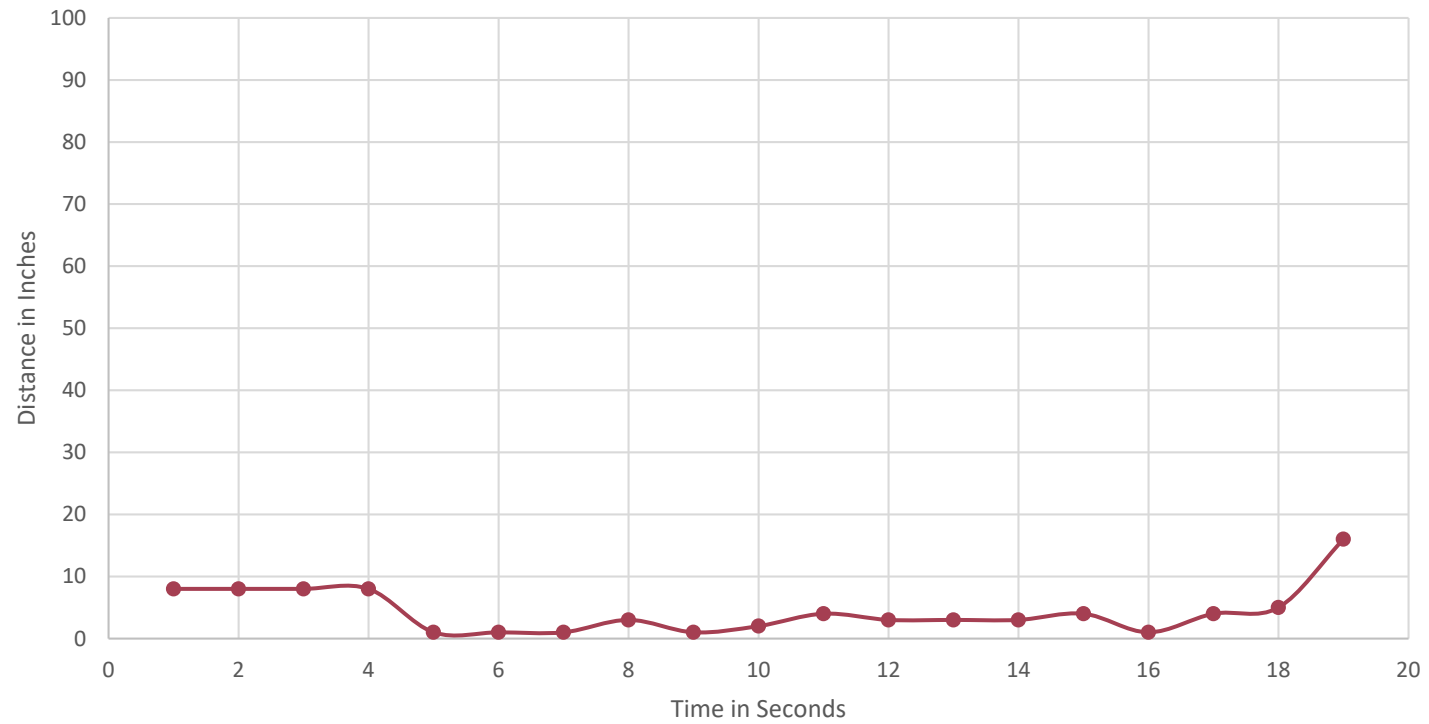
Arduino Mega or Mega 2560 ...

```
CEIS101_5_copy_20220328213120.ino
1  #define trigPin 8
2  #define echoPin 7
3  #define Rled 2
4  #define Yled 3
5  #define Gled 4
6  #define buzzer 10
7
8  void setup() {
9  Serial.begin(9600);
10 Serial.println("CEIS101 Course Project Module 5");
11 Serial.println("Name: Deven Williams "); //replace xxxxx with your name
12
13 pinMode(trigPin, OUTPUT);
14 pinMode(echoPin, INPUT);
15 pinMode(Rled, OUTPUT);
16 pinMode(Yled, OUTPUT);
```

Output Serial Monitor X

# PLOT OF DATA (GRAPH FROM EXCEL)

CEIS101 Course Project Module 5 Name: Deven Williams

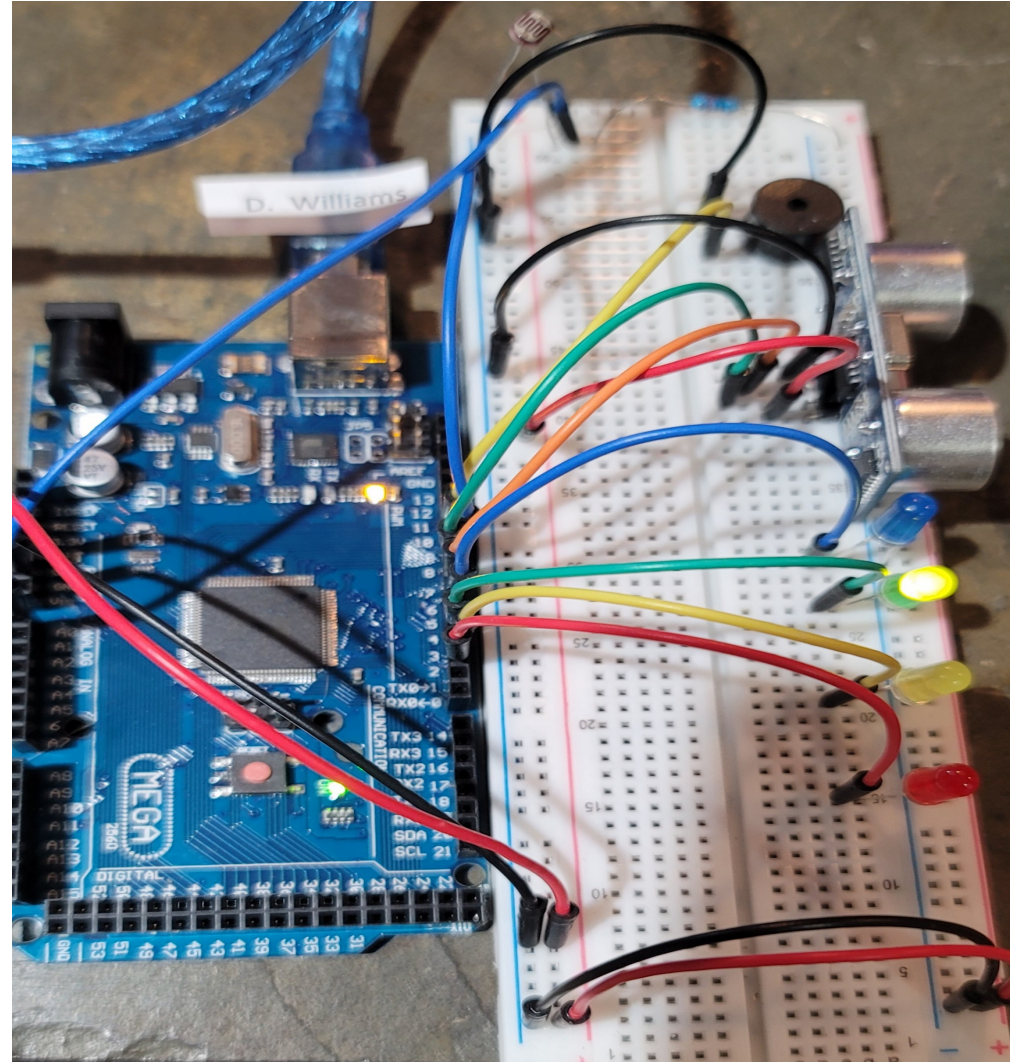




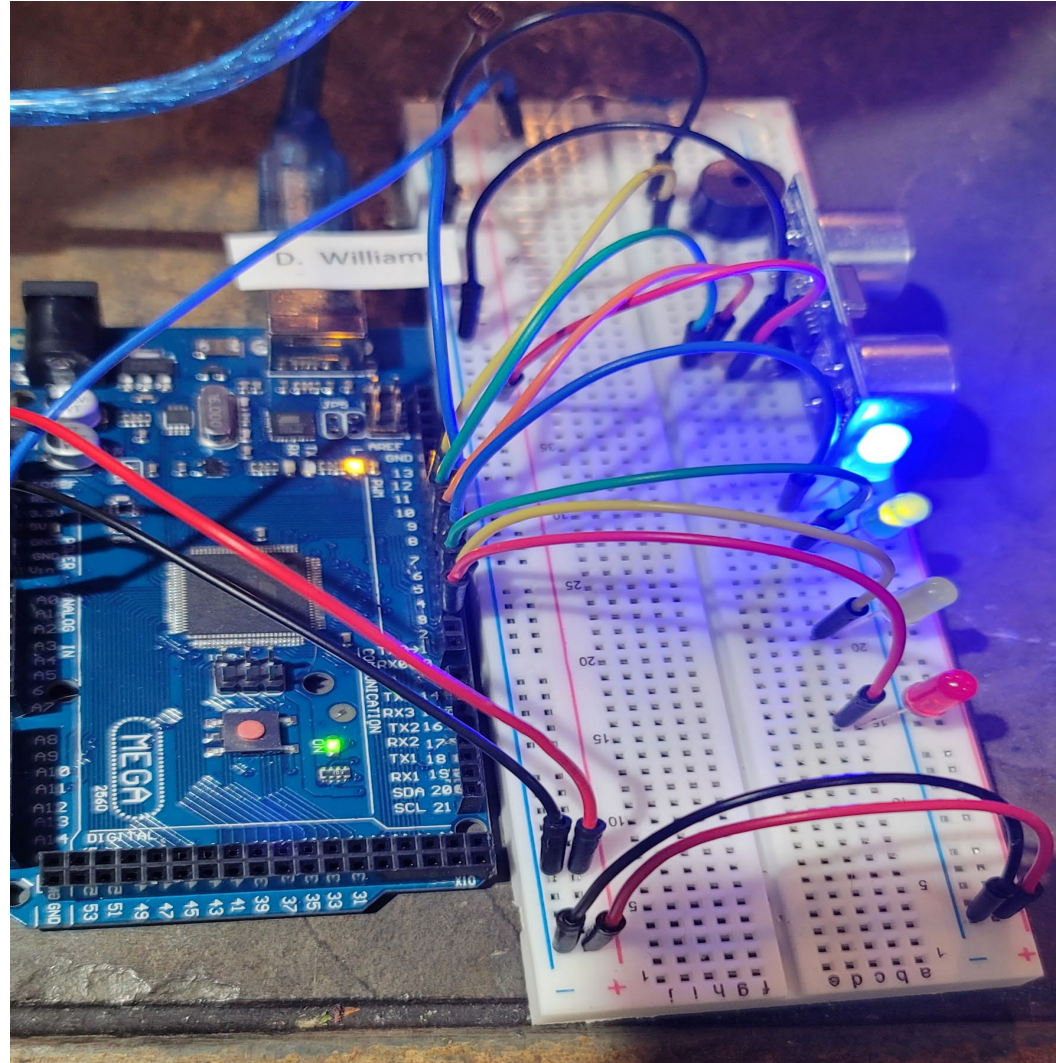
# ADDING AUTOMATED LIGHT TO SMART HOME SECURITY SYSTEM



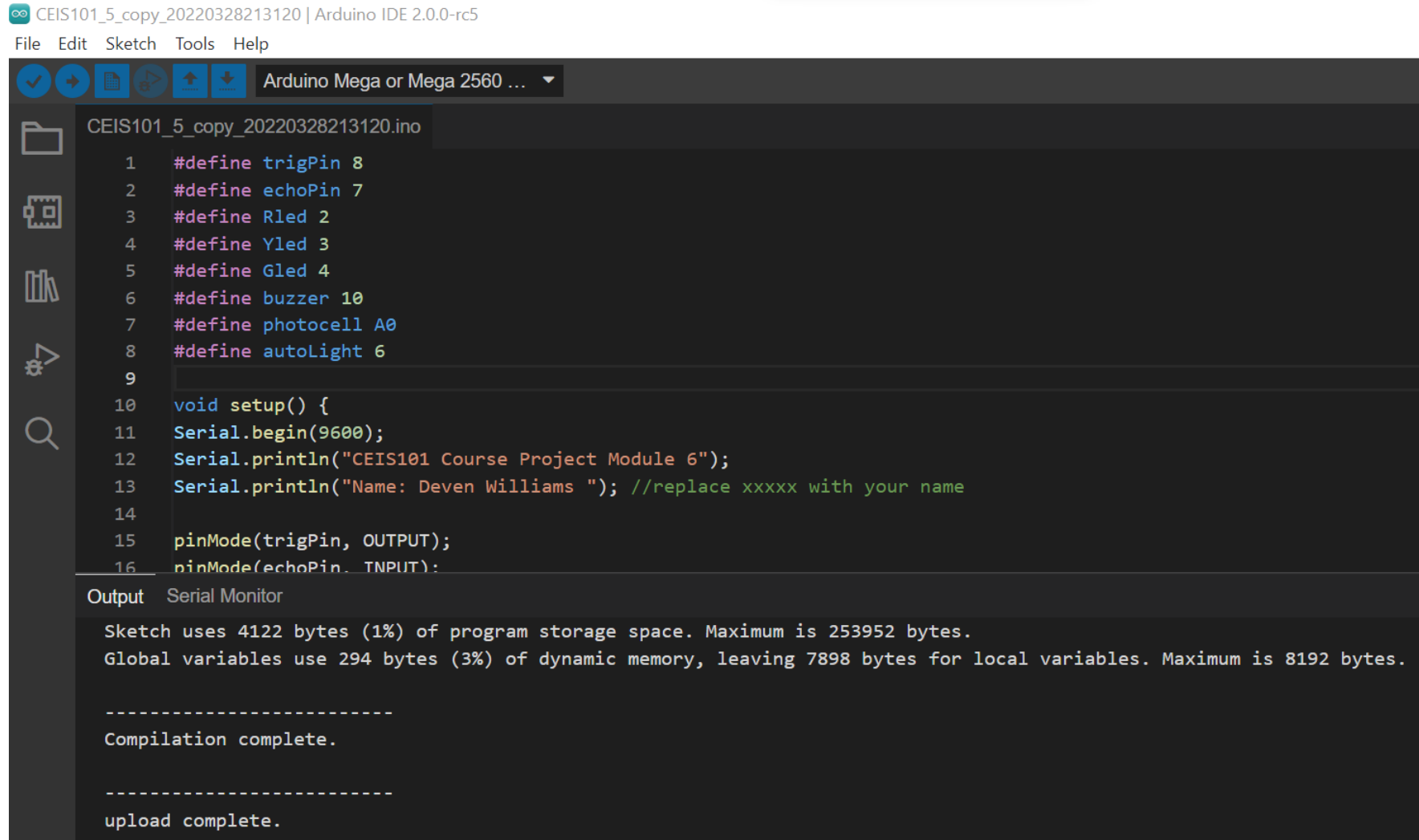
# CIRCUIT WITH AUTOMATED BLUE LED OFF (PICTURE)



# CIRCUIT WITH AUTOMATED BLUE LED ON (PICTURE)



# ARDUINO CODE (SCREENSHOT)



The screenshot shows the Arduino IDE interface. At the top, the title bar reads "CEIS101\_5\_copy\_20220328213120 | Arduino IDE 2.0.0-rc5". Below the title bar is a menu bar with "File", "Edit", "Sketch", "Tools", and "Help". A toolbar contains icons for check, run, upload, and download, along with a dropdown menu set to "Arduino Mega or Mega 2560 ...". The main workspace displays a file named "CEIS101\_5\_copy\_20220328213120.ino" with the following code:

```
1  #define trigPin 8
2  #define echoPin 7
3  #define Rled 2
4  #define Yled 3
5  #define Gled 4
6  #define buzzer 10
7  #define photocell A0
8  #define autoLight 6
9
10 void setup() {
11   Serial.begin(9600);
12   Serial.println("CEIS101 Course Project Module 6");
13   Serial.println("Name: Deven Williams "); //replace xxxxx with your name
14
15   pinMode(trigPin, OUTPUT);
16   pinMode(echoPin, INPUT);
```

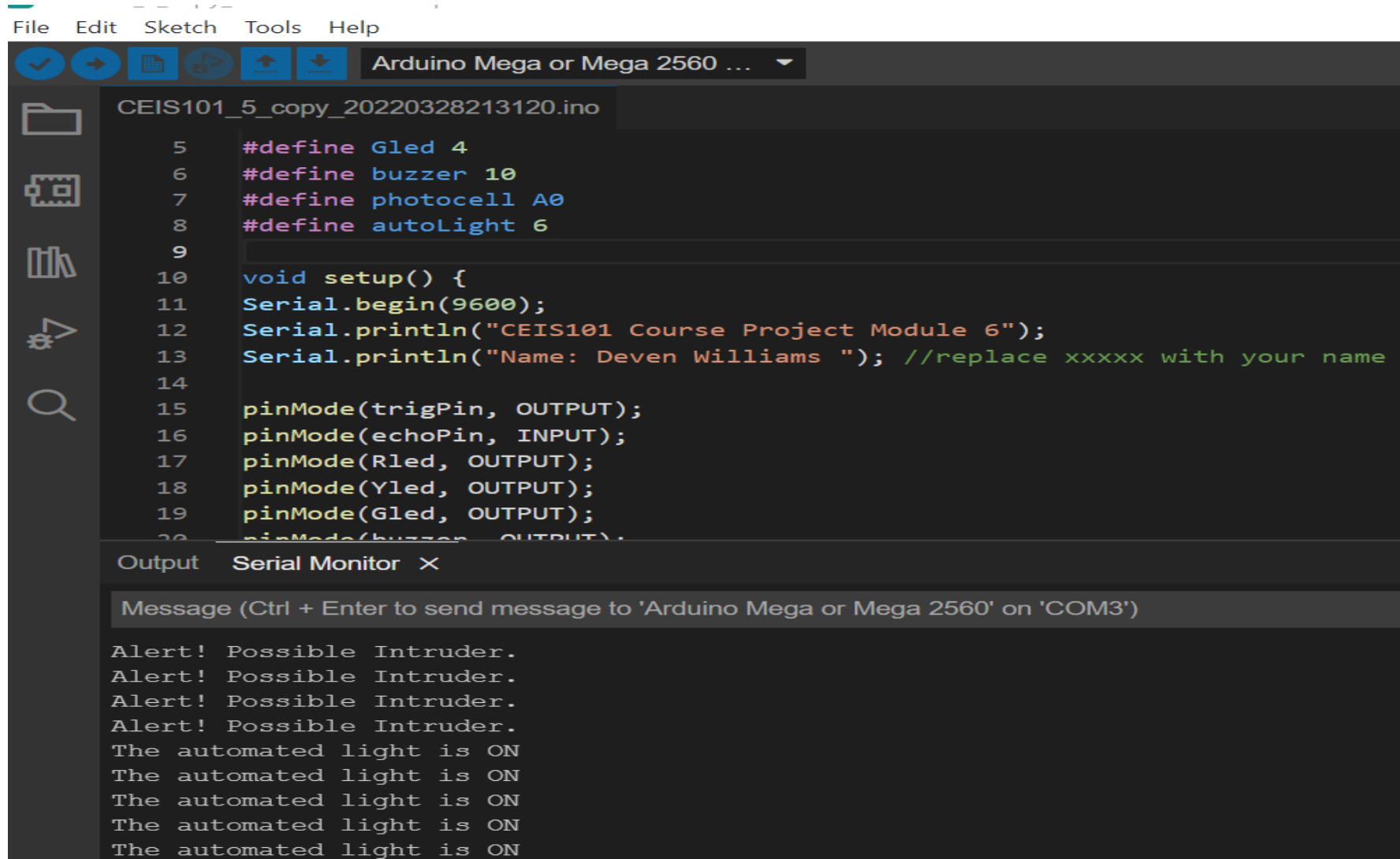
Below the code editor is the "Output" window, which is currently displaying the "Serial Monitor" output. The output text is as follows:

```
Sketch uses 4122 bytes (1%) of program storage space. Maximum is 253952 bytes.
Global variables use 294 bytes (3%) of dynamic memory, leaving 7898 bytes for local variables. Maximum is 8192 bytes.

-----
Compilation complete.

-----
upload complete.
```

# SERIAL MONITOR (SCREENSHOT)



The screenshot shows the Arduino IDE interface. The top menu bar includes File, Edit, Sketch, Tools, and Help. Below the menu is a toolbar with icons for checkmark, run, upload, and download. The main window displays a sketch named "CEIS101\_5\_copy\_20220328213120.ino" for an "Arduino Mega or Mega 2560". The code defines pins for Gled (4), buzzer (10), photocell (A0), and autoLight (6). The setup function initializes serial communication at 9600 baud and prints "CEIS101 Course Project Module 6" and "Name: Deven Williams". The main loop contains pin mode declarations for trigPin, echoPin, Rled, Yled, Gled, and buzzer.

```
5 #define Gled 4
6 #define buzzer 10
7 #define photocell A0
8 #define autoLight 6
9
10 void setup() {
11   Serial.begin(9600);
12   Serial.println("CEIS101 Course Project Module 6");
13   Serial.println("Name: Deven Williams "); //replace xxxxx with your name
14
15   pinMode(trigPin, OUTPUT);
16   pinMode(echoPin, INPUT);
17   pinMode(Rled, OUTPUT);
18   pinMode(Yled, OUTPUT);
19   pinMode(Gled, OUTPUT);
20   pinMode(buzzer, OUTPUT);
}
```

The Serial Monitor window is open, showing the output of the sketch. The message "Message (Ctrl + Enter to send message to 'Arduino Mega or Mega 2560' on 'COM3')" is displayed at the top. The output consists of four "Alert! Possible Intruder." messages followed by five "The automated light is ON" messages.

```
Alert! Possible Intruder.
Alert! Possible Intruder.
Alert! Possible Intruder.
Alert! Possible Intruder.
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
```



# CHALLENGES

With any project there will undoubtedly be obstacles or challenges that arise. The unfamiliarity with the associated hardware, software, and execution tools stood challenging at first. The importance of understanding your resources was never clearer and more evident. Actions were taken to learn, understand and apply these resources . This resulted in an increased level of self-efficacy that laid the foundation for a successful project submission.

# CAREER SKILLS ACQUIRED

The pursuit of becoming a Technologist and Technical Manager persists. Several technical skills were present during this project. Mastery of these skills is and should always be the goal. Gains were made in the following areas:

- Organizational Skills
- Attention to Detail
- Resource development
- Backwards engineering
- Programming
- Troubleshooting

# CONCLUSION

In conclusion, this project shines light on the power of the willingness to learn. If you have that willingness, coupled with proper tools and a passion to contribute to a better society, then the sky is the limit. The IoT community is ever-growing and with that growth new issues will surface. We must stand ready to mitigate these issues with regard to technology. This project is but a simple representation of that desire and how we can use technology to protect our most valued possessions.

# THANK YOU



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