Smart Home Automated Security Project

CEIS101 Final Project

July Session 2024

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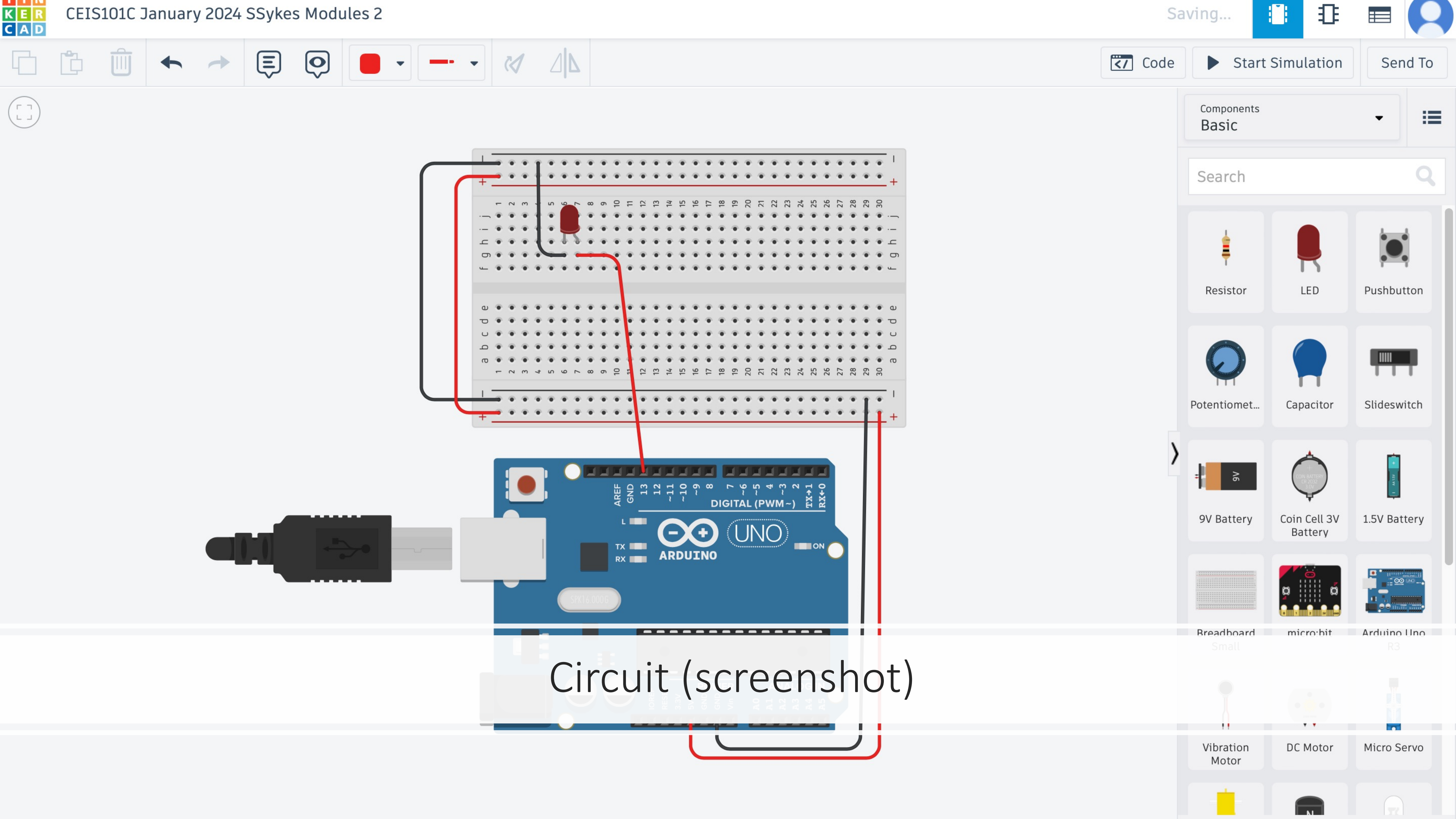
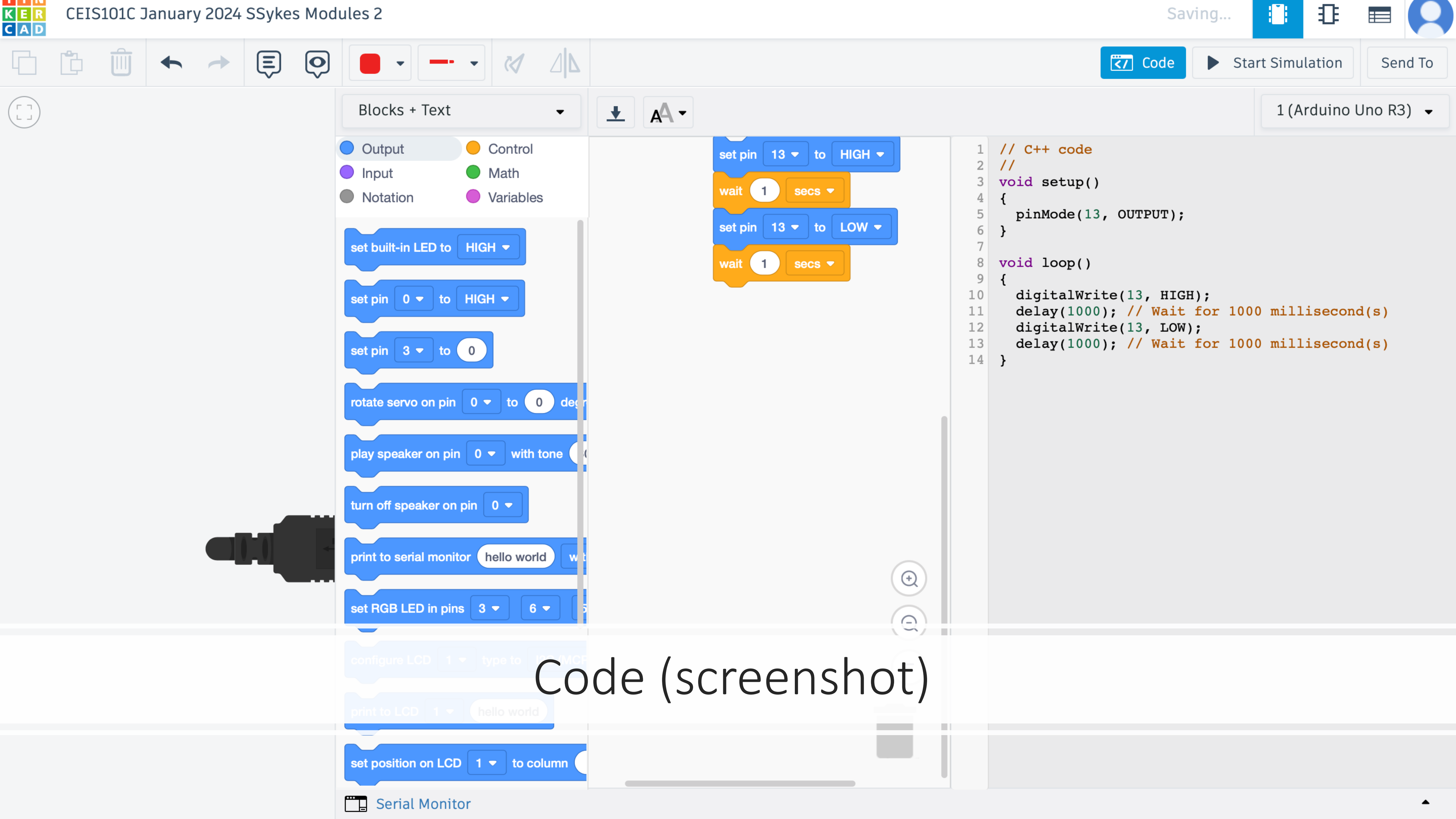
Prof. John Lambrou

Introduction

- Smart Home Automated Security System
- The objective is to build out in entire smart home security system that is fully operational.
- Tools used were Tinckercad, Microsoft powerpoint, and Microsoft word



Circuit (screenshot)



CEIS101C January 2024 SSykes Modules 2

Blocks + Text

1 (Arduino Uno R3)

```
set pin 13 to HIGH
wait 1 secs
set pin 13 to LOW
wait 1 secs
```

```
// C++ code
//
void setup()
{
  pinMode(13, OUTPUT);
}

void loop()
{
  digitalWrite(13, HIGH);
  delay(1000); // Wait for 1000 millisecond(s)
  digitalWrite(13, LOW);
  delay(1000); // Wait for 1000 millisecond(s)
}
```

Code (screenshot)

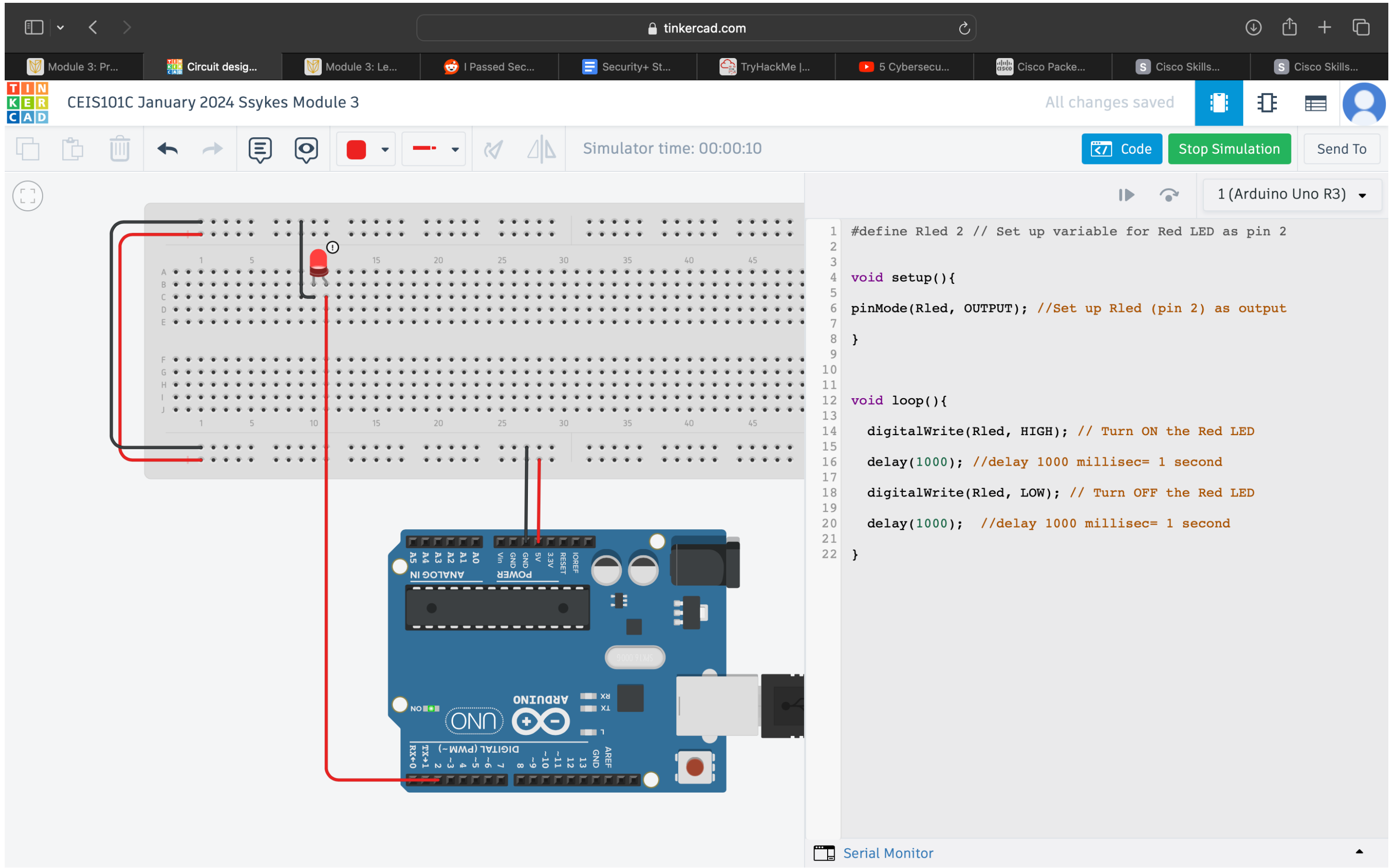
CEIS101
Module 3

Inventory of Parts, Circuit Building, and Displaying Messages

Organization of Project Components (picture)

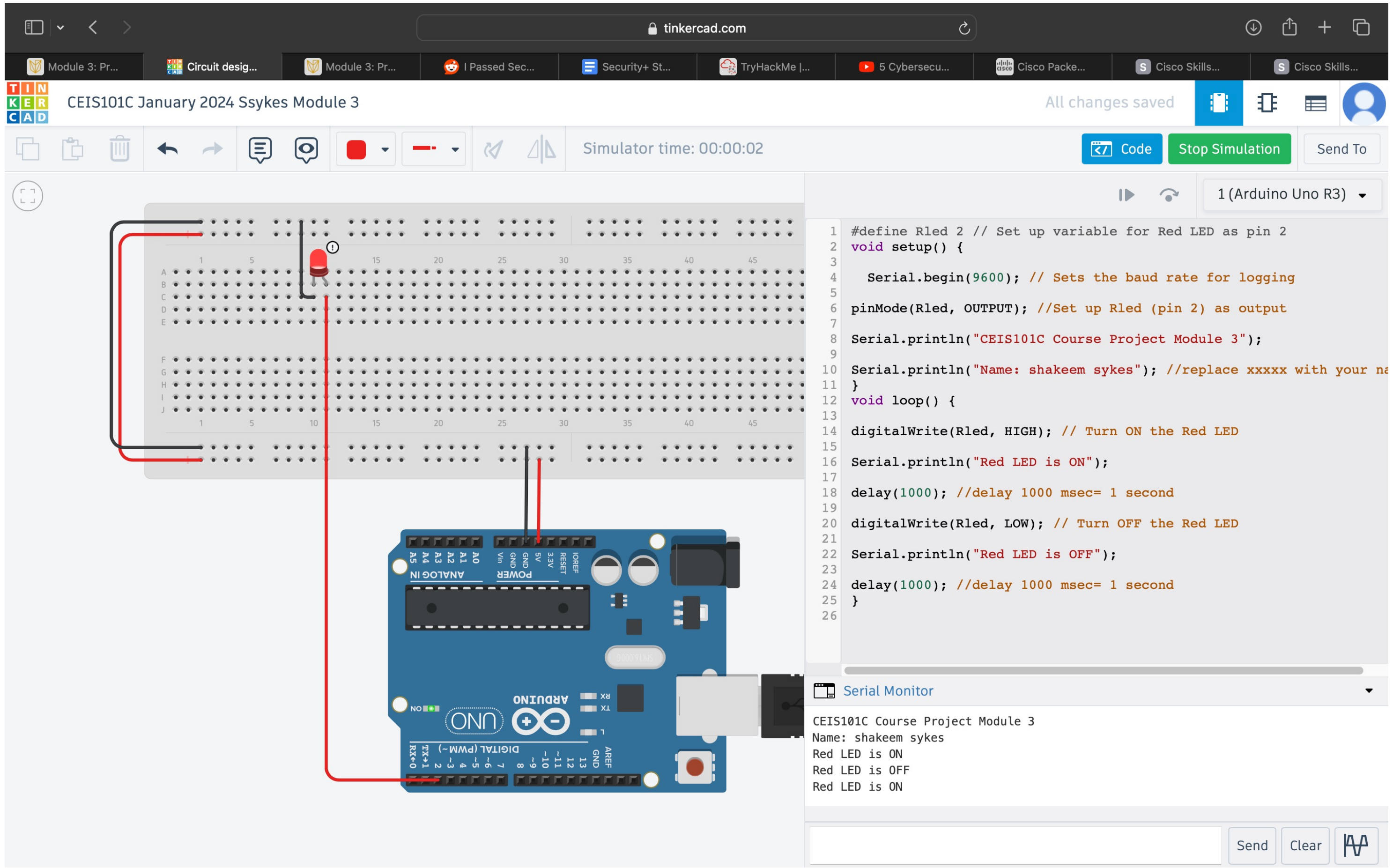
- Arduino Uno
- Breadboard
- Resistor 10kΩ
- LEDs
- Ultrasonic Sensor
- Active Buzzer
- Photoresistor
- Wires

Circuit with red LED on (picture)



```
#define Rled 2 // Set up variable for Red LED as pin 2


void setup(){

pinMode(Rled, OUTPUT); //Set up Rled (pin 2) as output

}



void loop(){

  digitalWrite(Rled, HIGH); // Turn ON the Red LED

  delay(1000); //delay 1000 millisec= 1 second

  digitalWrite(Rled, LOW); // Turn OFF the Red LED

  delay(1000);  //delay 1000 millisec= 1 second

}
```

Serial Monitor (screenshot)



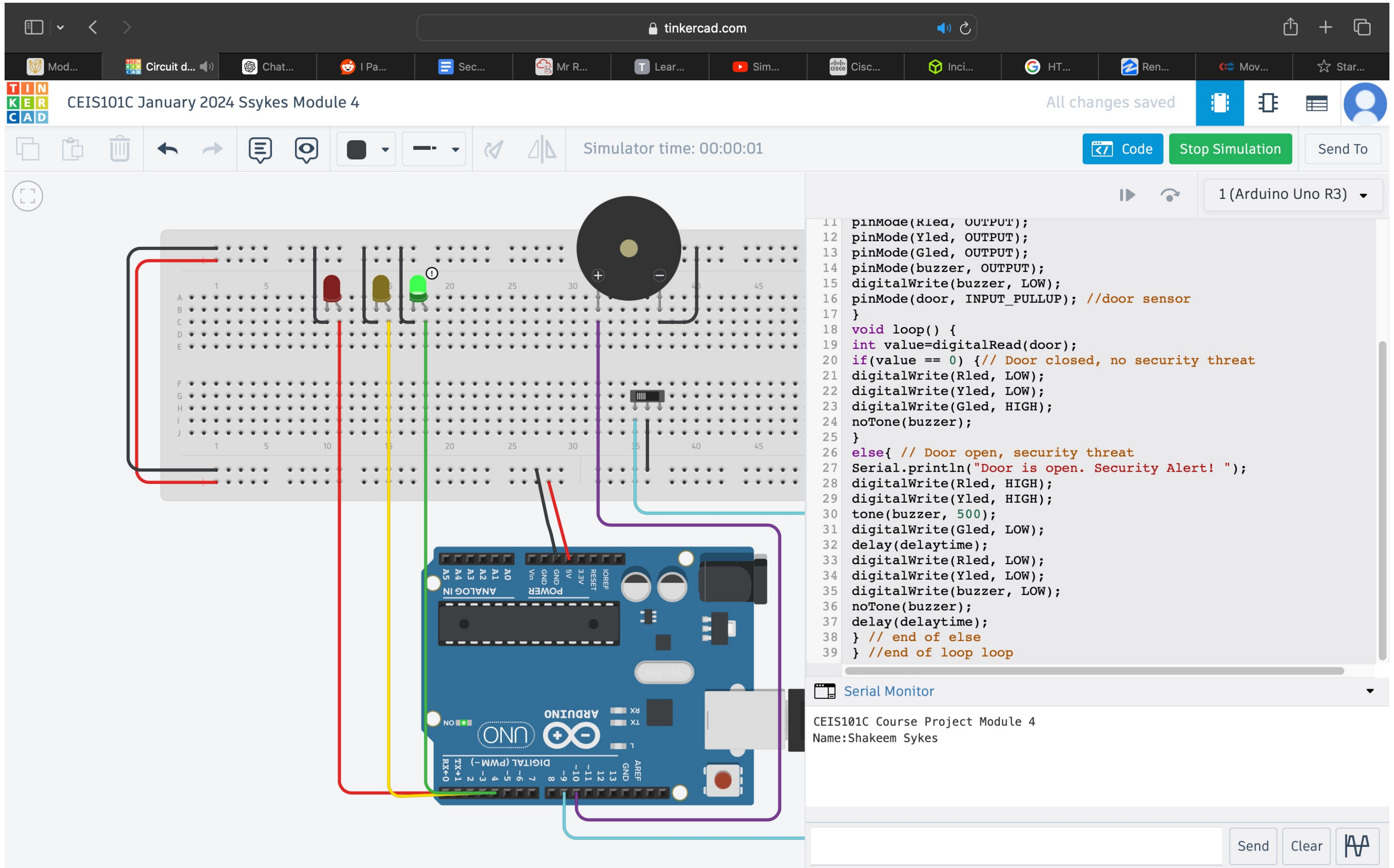
```
#define Rled 2 // Set up variable for Red LED as pin 2
void setup() {

  Serial.begin(9600); // Sets the baud rate for logging

pinMode(Rled, OUTPUT); //Set up Rled (pin 2) as output

Serial.println("CEIS101C Course Project Module 3");

Serial.println("Name: shakeem sykes"); //replace xxxxx with your na
}
void loop() {

digitalWrite(Rled, HIGH); // Turn ON the Red LED

Serial.println("Red LED is ON");

delay(1000); //delay 1000 msec= 1 second

digitalWrite(Rled, LOW); // Turn OFF the Red LED

Serial.println("Red LED is OFF");

delay(1000); //delay 1000 msec= 1 second
}
```

```
CEIS101C Course Project Module 3
Name: shakeem sykes
Red LED is ON
Red LED is OFF
Red LED is ON
```

CEIS101
Module 4

Adding Door Sensor to Smart Home System

Circuit of door closed with Green LED ON (picture)

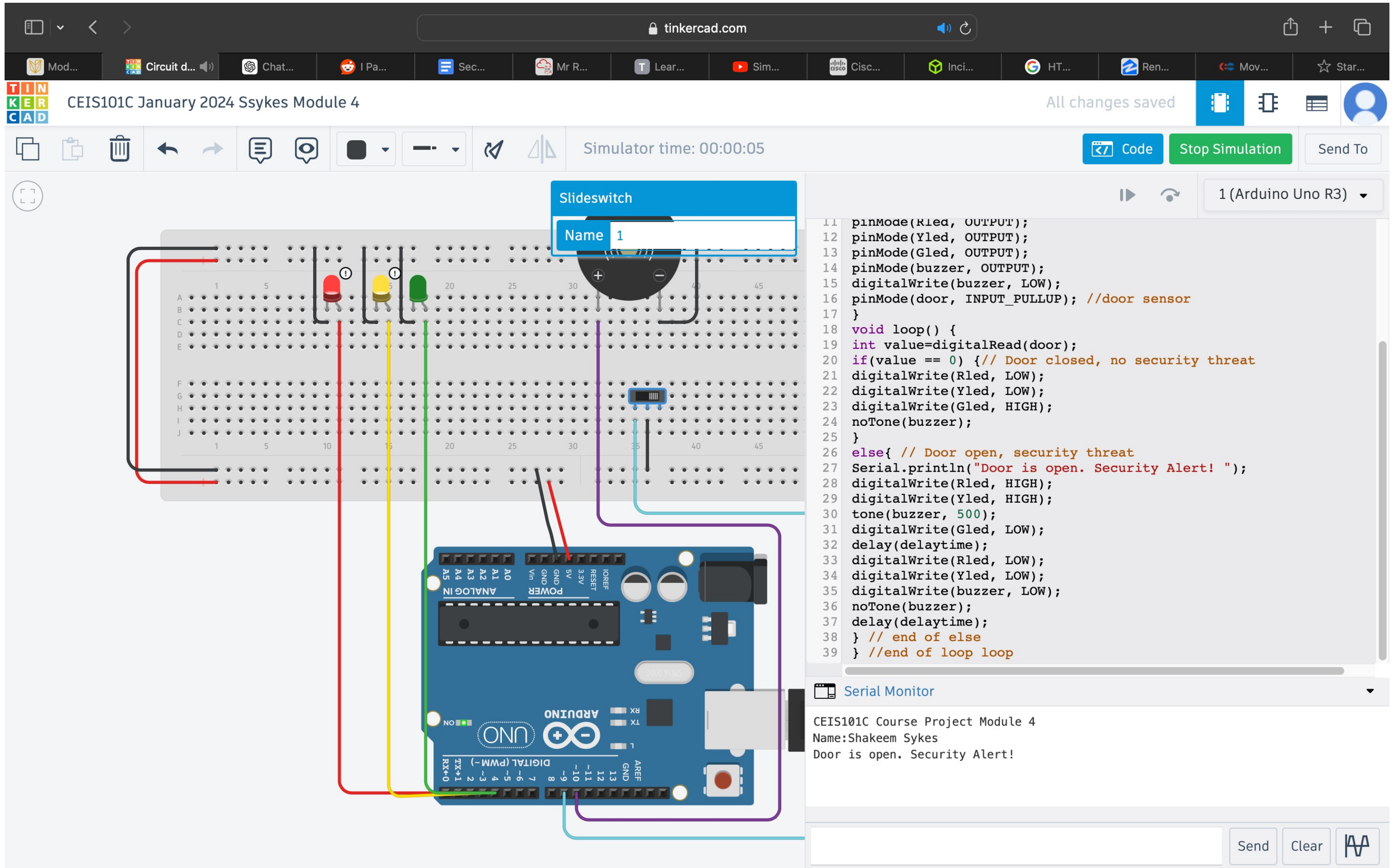


CEIS101C January 2024 Ssykes Module 4

```
pinMode(Rled, OUTPUT);
pinMode(Yled, OUTPUT);
pinMode(Gled, OUTPUT);
pinMode(buzzer, OUTPUT);
digitalWrite(buzzer, LOW);
pinMode(door, INPUT_PULLUP); //door sensor
}
void loop() {
int value=digitalRead(door);
if(value == 0) {// Door closed, no security threat
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(Gled, HIGH);
noTone(buzzer);
}
else{ // Door open, security threat
Serial.println("Door is open. Security Alert! ");
digitalWrite(Rled, HIGH);
digitalWrite(Yled, HIGH);
tone(buzzer, 500);
digitalWrite(Gled, LOW);
delay(delaytime);
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(buzzer, LOW);
noTone(buzzer);
delay(delaytime);
} // end of else
} //end of loop loop
```

```
CEIS101C Course Project Module 4
Name:Shakeem Sykes
```

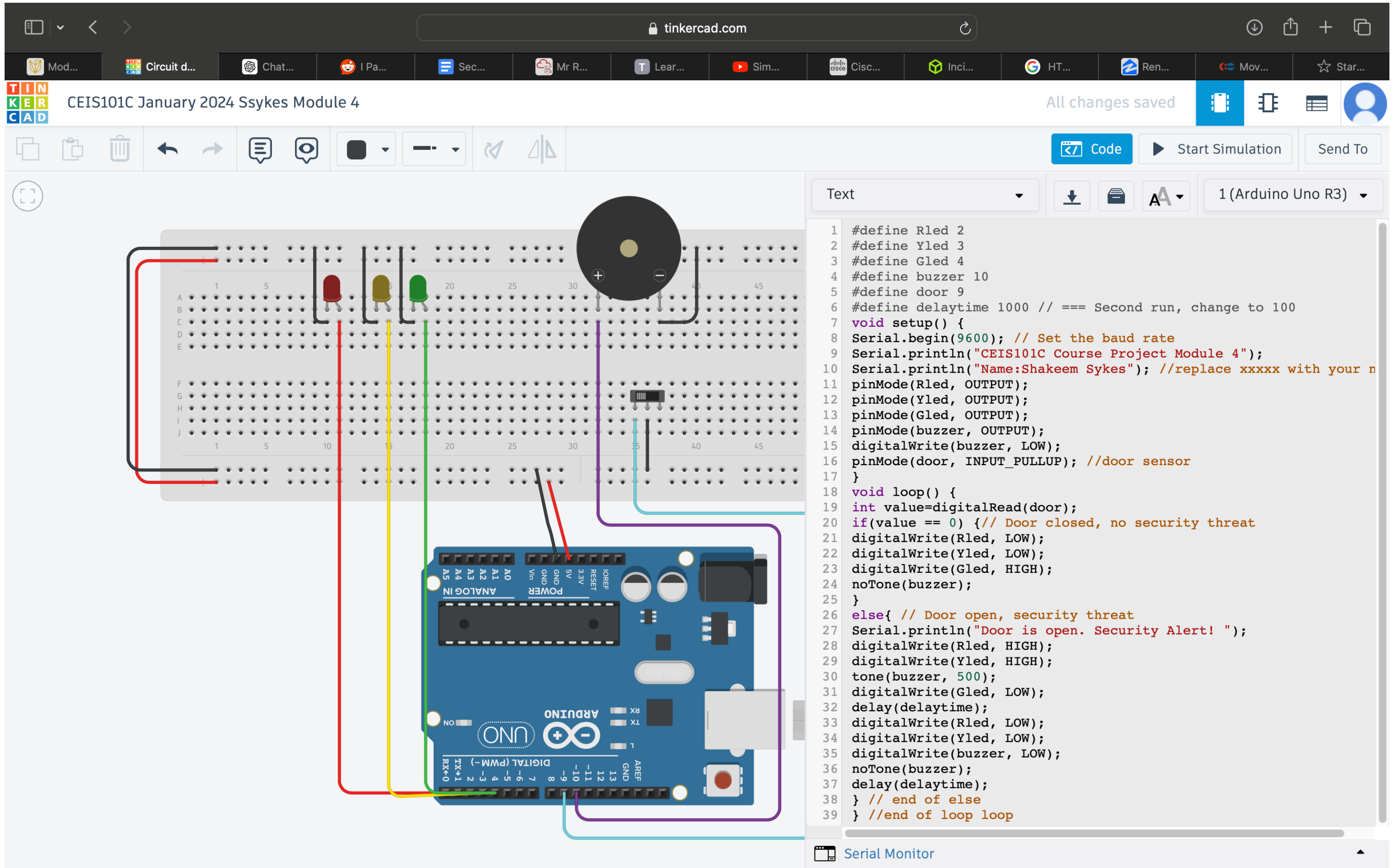
Circuit of door open with Green LED OFF (picture)



```
pinMode(Rled, OUTPUT);
pinMode(Yled, OUTPUT);
pinMode(Gled, OUTPUT);
pinMode(buzzer, OUTPUT);
digitalWrite(buzzer, LOW);
pinMode(door, INPUT_PULLUP); //door sensor
}
void loop() {
int value=digitalRead(door);
if(value == 0) {// Door closed, no security threat
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(Gled, HIGH);
noTone(buzzer);
}
else{ // Door open, security threat
Serial.println("Door is open. Security Alert! ");
digitalWrite(Rled, HIGH);
digitalWrite(Yled, HIGH);
tone(buzzer, 500);
digitalWrite(Gled, LOW);
delay(delaytime);
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(buzzer, LOW);
noTone(buzzer);
delay(delaytime);
} // end of else
} //end of loop loop
```

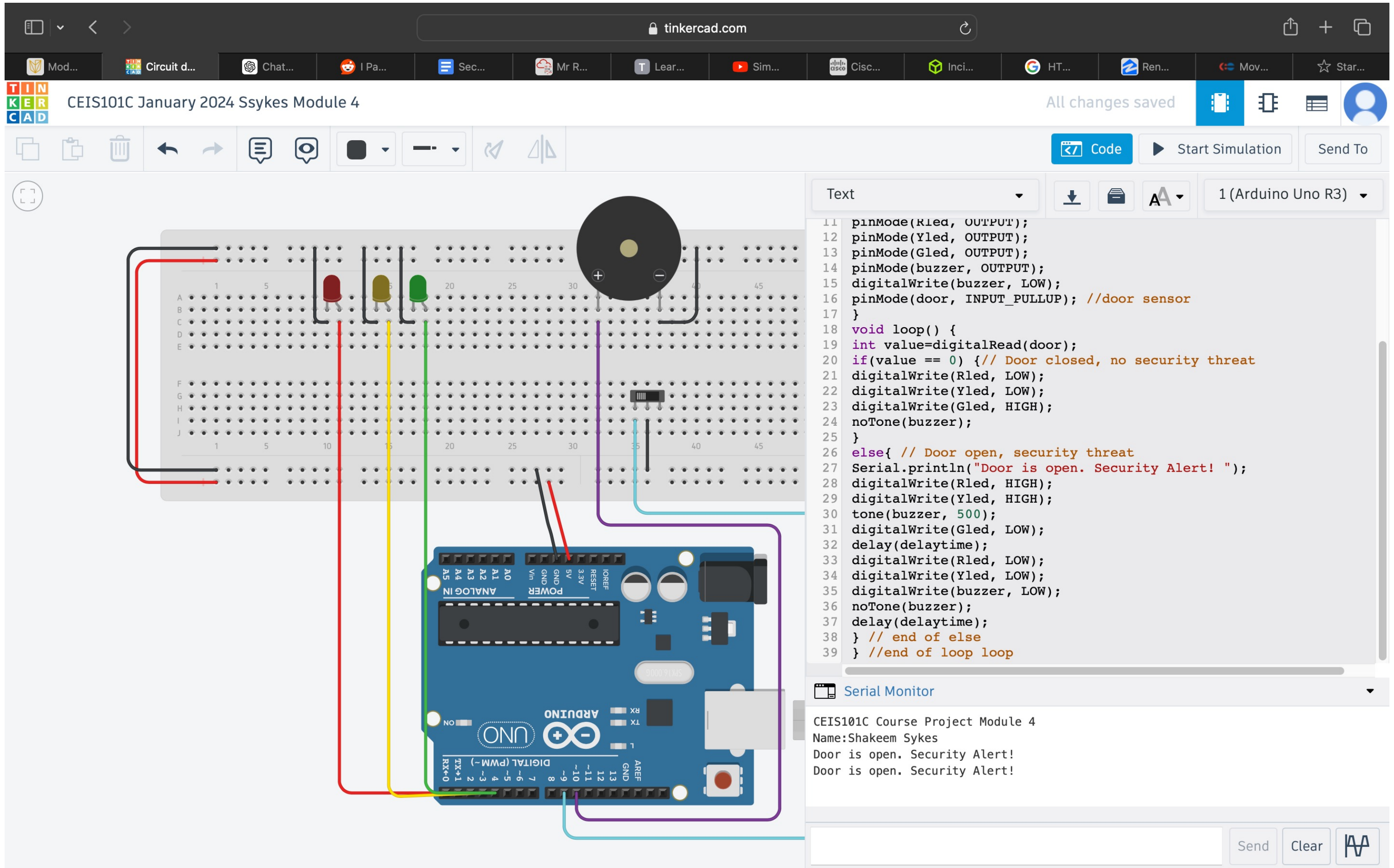
```
CEIS101C Course Project Module 4
Name:Shakeem Sykes
Door is open. Security Alert!
```

Arduino Code (screenshot)



```
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
#define door 9
#define delaytime 1000 // === Second run, change to 100
void setup() {
Serial.begin(9600); // Set the baud rate
Serial.println("CEIS101C Course Project Module 4");
Serial.println("Name:Shakeem Sykes"); //replace xxxxx with your n
pinMode(Rled, OUTPUT);
pinMode(Yled, OUTPUT);
pinMode(Gled, OUTPUT);
pinMode(buzzer, OUTPUT);
digitalWrite(buzzer, LOW);
pinMode(door, INPUT_PULLUP); //door sensor
}
void loop() {
int value=digitalRead(door);
if(value == 0) {// Door closed, no security threat
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(Gled, HIGH);
noTone(buzzer);
}
else{ // Door open, security threat
Serial.println("Door is open. Security Alert! ");
digitalWrite(Rled, HIGH);
digitalWrite(Yled, HIGH);
tone(buzzer, 500);
digitalWrite(Gled, LOW);
delay(delaytime);
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(buzzer, LOW);
noTone(buzzer);
delay(delaytime);
} // end of else
} //end of loop loop
```

Serial Monitor (screenshot)



```
pinMode(Rled, OUTPUT);
pinMode(Yled, OUTPUT);
pinMode(Gled, OUTPUT);
pinMode(buzzer, OUTPUT);
digitalWrite(buzzer, LOW);
pinMode(door, INPUT_PULLUP); //door sensor
}
void loop() {
int value=digitalRead(door);
if(value == 0) {// Door closed, no security threat
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(Gled, HIGH);
noTone(buzzer);
}
else{ // Door open, security threat
Serial.println("Door is open. Security Alert! ");
digitalWrite(Rled, HIGH);
digitalWrite(Yled, HIGH);
tone(buzzer, 500);
digitalWrite(Gled, LOW);
delay(delaytime);
digitalWrite(Rled, LOW);
digitalWrite(Yled, LOW);
digitalWrite(buzzer, LOW);
noTone(buzzer);
delay(delaytime);
} // end of else
} //end of loop loop
```

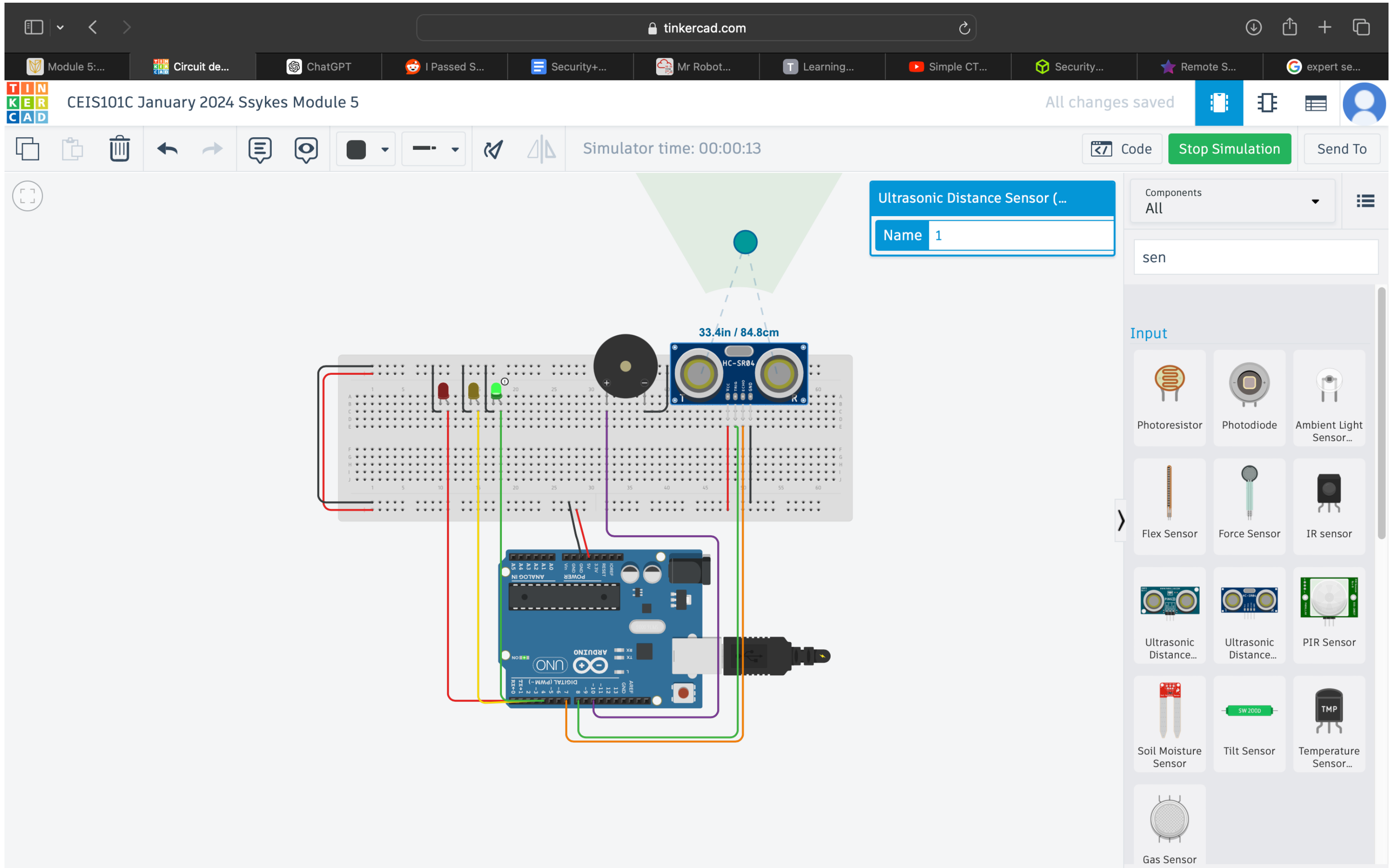
```
CEIS101C Course Project Module 4
Name:Shakeem Sykes
Door is open. Security Alert!
Door is open. Security Alert!
```

CEIS101 Module 5

Adding Distance Sensor to Smart Home System

and Conducting Data Analysis

Circuit with green LED on (picture)



CEIS101C January 2024 Ssykes Module 5

Simulator time: 00:00:13

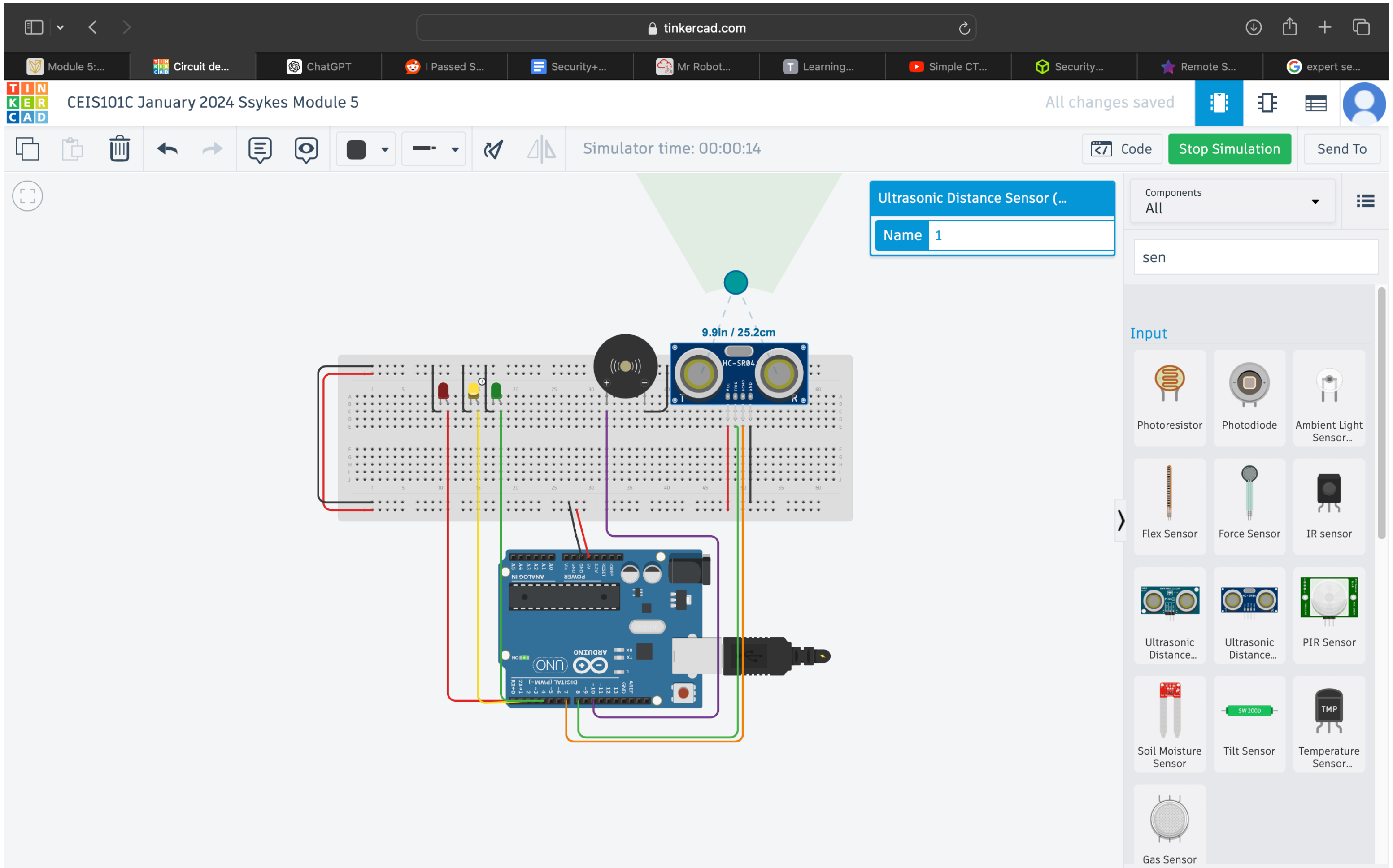
Ultrasonic Distance Sensor (...

Name 1

Components All

sen

Circuit with yellow LED on (picture)



tinkercad.com

CEIS101C January 2024 Ssykes Module 5

All changes saved

Simulator time: 00:00:14

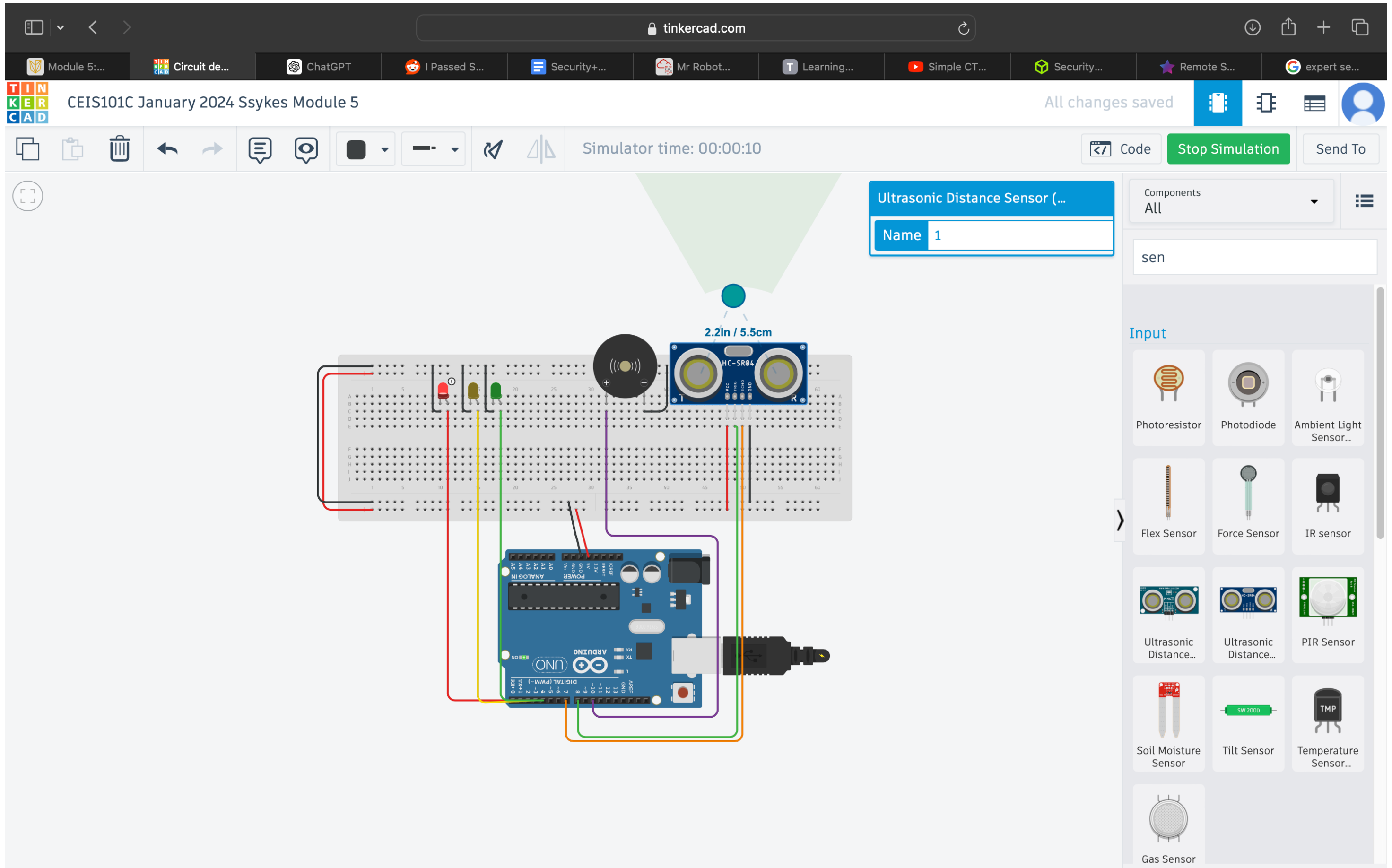
Ultrasonic Distance Sensor (...

Name: 1

Components: All

sen

Circuit with red LED on (picture)



CEIS101C January 2024 Ssykes Module 5

Simulator time: 00:00:10

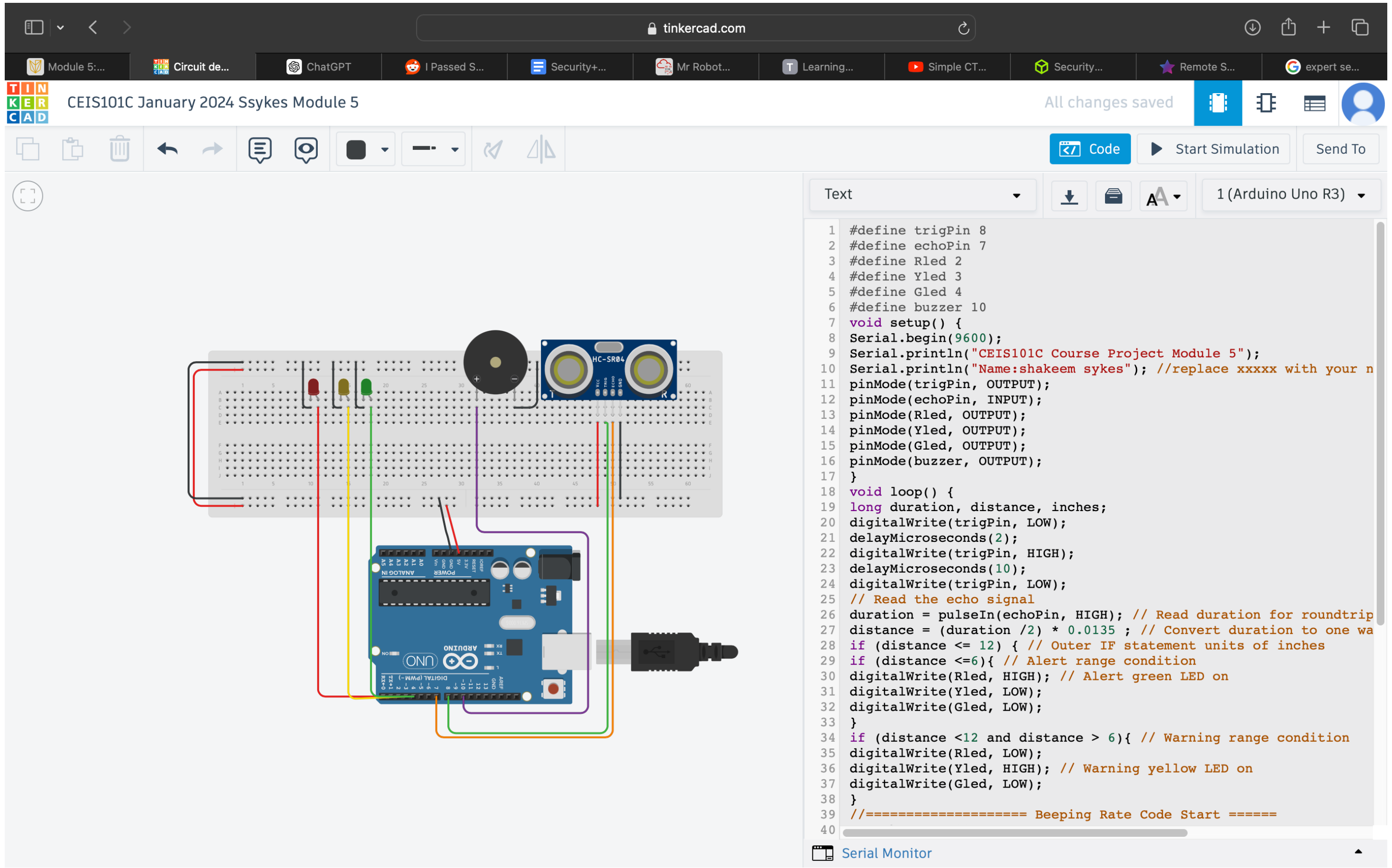
Ultrasonic Distance Sensor (...

Name 1

Components All

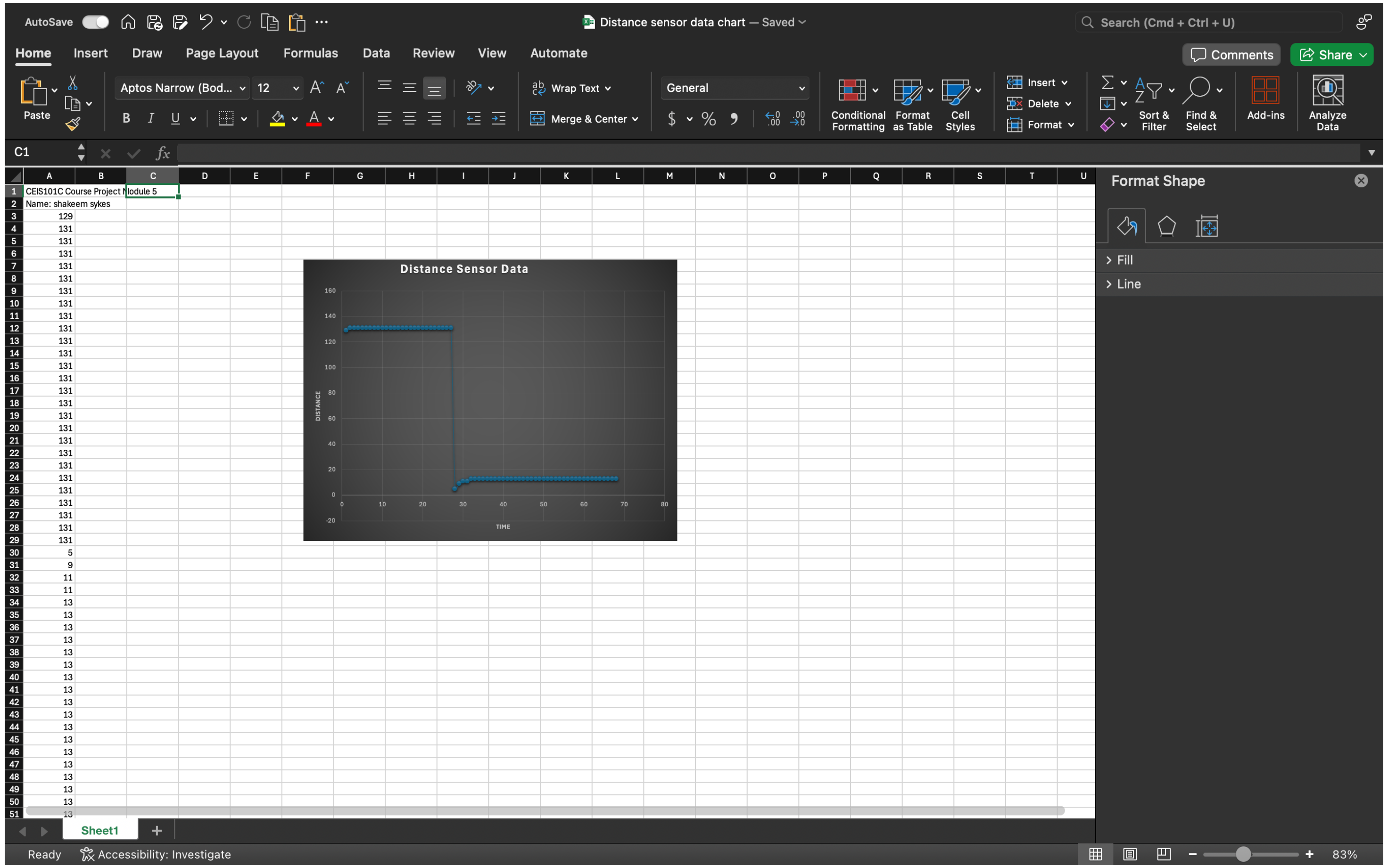
sen

Arduino Code (screenshot)



```
#define trigPin 8
#define echoPin 7
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
void setup() {
Serial.begin(9600);
Serial.println("CEIS101C Course Project Module 5");
Serial.println("Name:shakeem sykes"); //replace xxxxx with your n
pinMode(trigPin, OUTPUT);
pinMode(echoPin, INPUT);
pinMode(Rled, OUTPUT);
pinMode(Yled, OUTPUT);
pinMode(Gled, OUTPUT);
pinMode(buzzer, OUTPUT);
}
void loop() {
long duration, distance, inches;
digitalWrite(trigPin, LOW);
delayMicroseconds(2);
digitalWrite(trigPin, HIGH);
delayMicroseconds(10);
digitalWrite(trigPin, LOW);
// Read the echo signal
duration = pulseIn(echoPin, HIGH); // Read duration for roundtrip
distance = (duration /2) * 0.0135 ; // Convert duration to one wa
if (distance <= 12) { // Outer IF statement units of inches
if (distance <=6){ // Alert range condition
digitalWrite(Rled, HIGH); // Alert green LED on
digitalWrite(Yled, LOW);
digitalWrite(Gled, LOW);
}
if (distance <12 and distance > 6){ // Warning range condition
digitalWrite(Rled, LOW);
digitalWrite(Yled, HIGH); // Warning yellow LED on
digitalWrite(Gled, LOW);
}
//==================== Beeping Rate Code Start ======
```

Plot of data (graph from Excel)



	A	B	C
1	CEIS101C Course Project Module 5		
2	Name: shakeem sykes		
3	129		
4	131		
5	131		
6	131		
7	131		
8	131		
9	131		
10	131		
11	131		
12	131		
13	131		
14	131		
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26	131		
27	131		
28	131		
29	131		
30	5		
31	9		
32	11		
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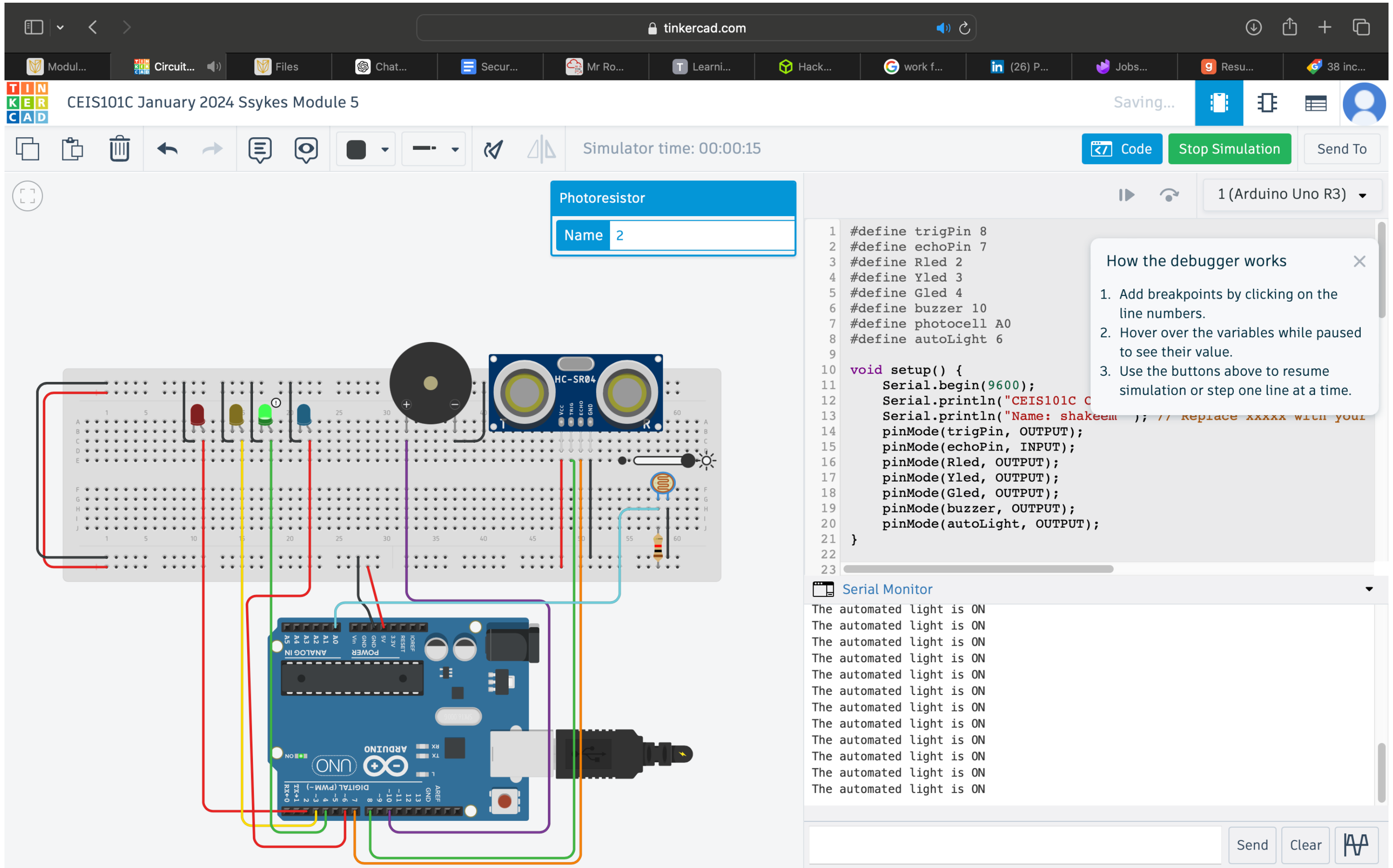
49	13		
50	13		
51	13		

CEIS101
Module 6

Adding Automated Light to Smart Home System

Circuit with automated LED off (picture)



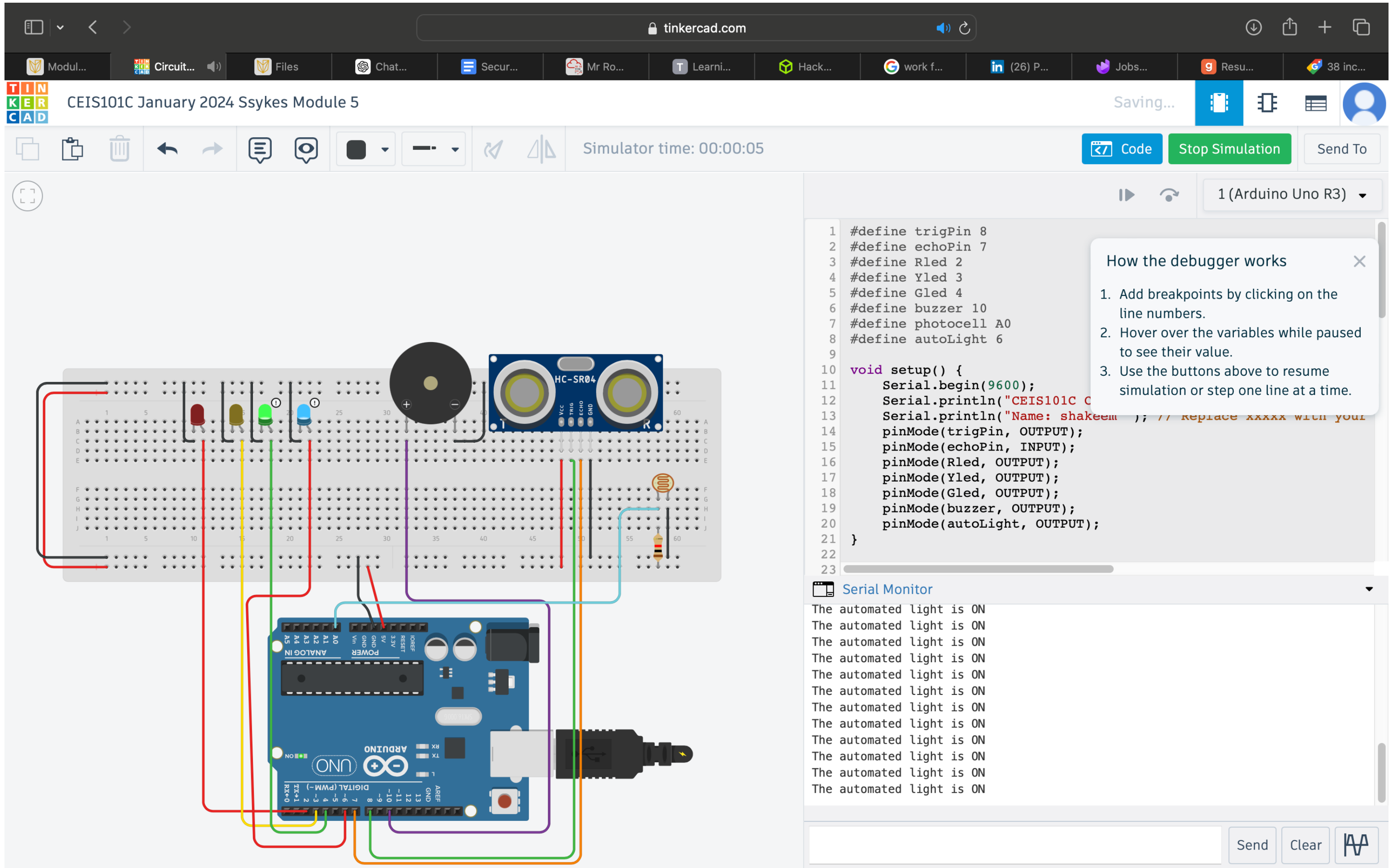
```
#define trigPin 8
#define echoPin 7
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
#define photocell A0
#define autoLight 6

void setup() {
    Serial.begin(9600);
    Serial.println("CEIS101C C
    Serial.println("Name: shakeem"); // Replace xxxxx with your
    pinMode(trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    pinMode(Rled, OUTPUT);
    pinMode(Yled, OUTPUT);
    pinMode(Gled, OUTPUT);
    pinMode(buzzer, OUTPUT);
    pinMode(autoLight, OUTPUT);
}
```

How the debugger works

1. Add breakpoints by clicking on the line numbers.
2. Hover over the variables while paused to see their value.
3. Use the buttons above to resume simulation or step one line at a time.

```
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
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
The automated light is ON
The automated light is ON
```

Circuit with automated LED on (picture)



CEIS101C January 2024 Ssykes Module 5

Simulator time: 00:00:05

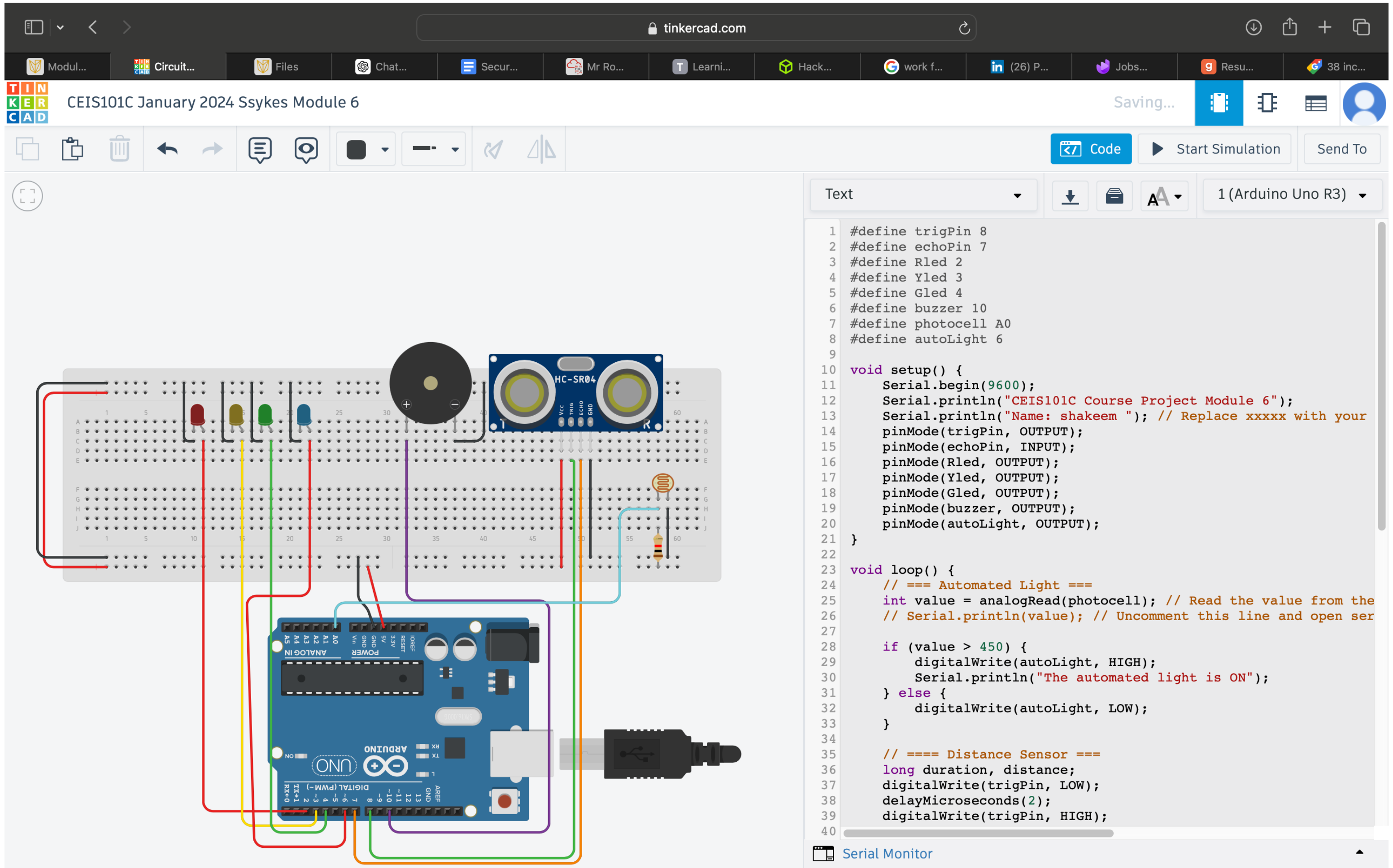
```
#define trigPin 8
#define echoPin 7
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
#define photocell A0
#define autoLight 6

void setup() {
    Serial.begin(9600);
    Serial.println("CEIS101C C
    Serial.println("Name: shakeem  "); // Replace xxxxx with your
    pinMode(trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    pinMode(Rled, OUTPUT);
    pinMode(Yled, OUTPUT);
    pinMode(Gled, OUTPUT);
    pinMode(buzzer, OUTPUT);
    pinMode(autoLight, OUTPUT);
}
```

How the debugger works

1. Add breakpoints by clicking on the line numbers.
2. Hover over the variables while paused to see their value.
3. Use the buttons above to resume simulation or step one line at a time.

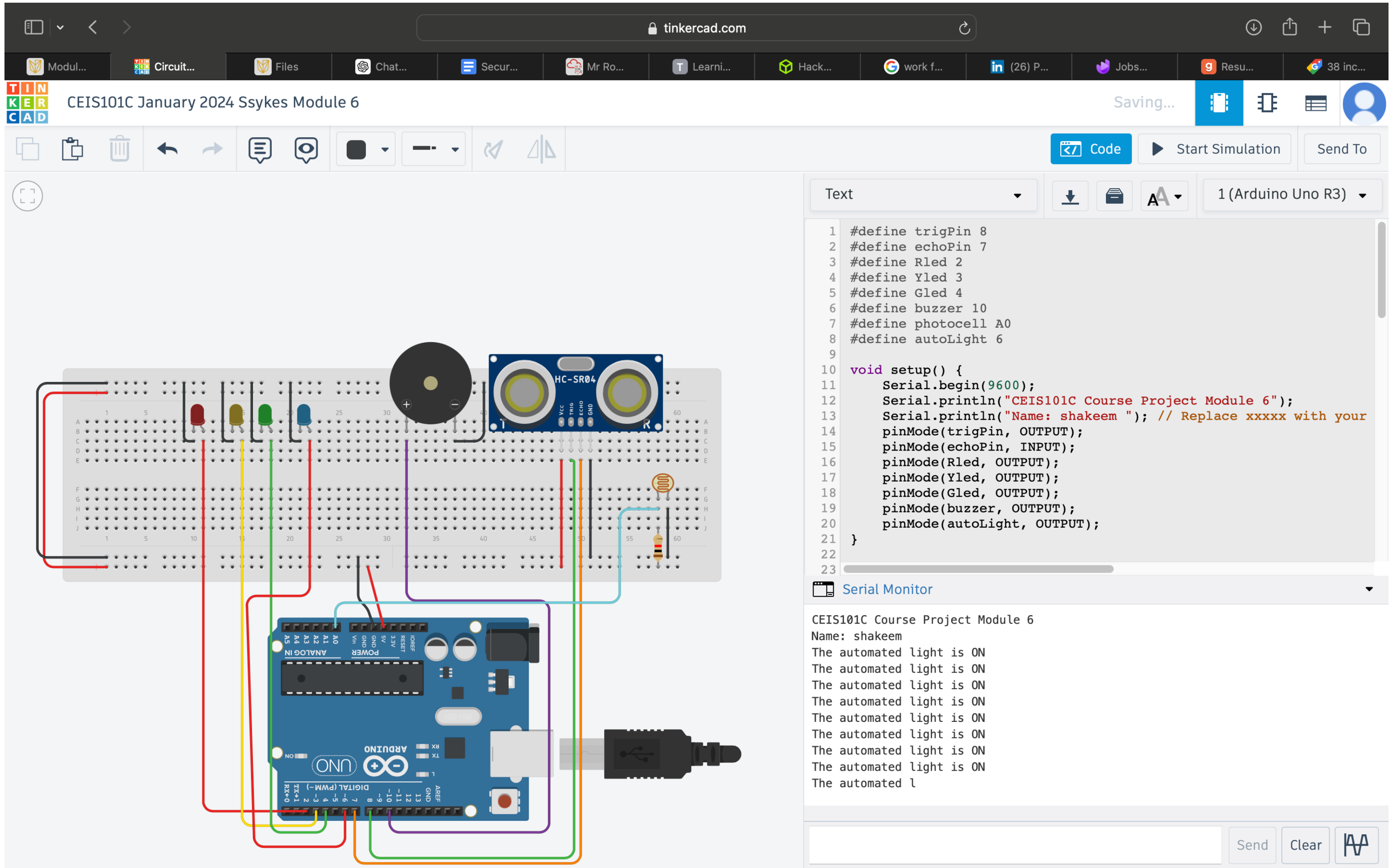
```
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
The automated light is ON
```

Arduino Code (screenshot)



```
#define trigPin 8
#define echoPin 7
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
#define photocell A0
#define autoLight 6

void setup() {
    Serial.begin(9600);
    Serial.println("CEIS101C Course Project Module 6");
    Serial.println("Name: shakeem "); // Replace xxxxx with your
    pinMode(trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    pinMode(Rled, OUTPUT);
    pinMode(Yled, OUTPUT);
    pinMode(Gled, OUTPUT);
    pinMode(buzzer, OUTPUT);
    pinMode(autoLight, OUTPUT);
}

void loop() {
    // === Automated Light ===
    int value = analogRead(photocell); // Read the value from the
    // Serial.println(value); // Uncomment this line and open ser

    if (value > 450) {
        digitalWrite(autoLight, HIGH);
        Serial.println("The automated light is ON");
    } else {
        digitalWrite(autoLight, LOW);
    }

    // ==== Distance Sensor ===
    long duration, distance;
    digitalWrite(trigPin, LOW);
    delayMicroseconds(2);
    digitalWrite(trigPin, HIGH);
```

Serial Monitor (screenshot)



```
#define trigPin 8
#define echoPin 7
#define Rled 2
#define Yled 3
#define Gled 4
#define buzzer 10
#define photocell A0
#define autoLight 6

void setup() {
    Serial.begin(9600);
    Serial.println("CEIS101C Course Project Module 6");
    Serial.println("Name: shakeem "); // Replace xxxxx with your
    pinMode(trigPin, OUTPUT);
    pinMode(echoPin, INPUT);
    pinMode(Rled, OUTPUT);
    pinMode(Yled, OUTPUT);
    pinMode(Gled, OUTPUT);
    pinMode(buzzer, OUTPUT);
    pinMode(autoLight, OUTPUT);
}

```

```
CEIS101C Course Project Module 6
Name: shakeem
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
The automated light is ON
The automated light is ON
The automated light is ON
The automated l
```

Challenges/Lessons Learned

- My Biggest Challenge during this project was the coding aspect.
- I researched through google on how to not completely change the code but minor tweaks to correct it.
- My biggest lesson learned was that one missing character in the code or missing piece of code could ruin the entire running process.

Career Skills

- **Electronics and Circuit Design:**
- **Component Familiarity:** Learn to work with various electronic components like sensors (e.g., motion, door/window), actuators (e.g., servos), microcontrollers (e.g., Arduino), and communication modules (e.g., Wi-Fi, Bluetooth).
- **Circuit Design:** Develop skills in designing and connecting circuits on a virtual platform, understanding how components interact within a system.
- **Programming and Coding:**
- **Microcontroller Programming:** Gain experience in programming microcontrollers like Arduino. Learn to write code to handle sensor inputs, control outputs, and implement security features.
- **Integration of Components:** Write code to integrate various sensors and actuators, ensuring they work together cohesively to provide a functional security system.
- **System Design and Architecture:**
- **Smart System Integration:** Understand how to integrate multiple components into a unified smart home security system, including sensors, alarms, and communication devices.
- **User Interface Design:** Learn to design user interfaces for monitoring and controlling the security system, which could involve creating simple control panels or dashboards.
- **Collaboration and Communication:**
- **Teamwork:** If working in a group, develop skills in collaborating with others, sharing responsibilities, and integrating different components and ideas.
- **Presentation Skills:** Learn to present and explain your system’s design and functionality to others, including potential users or stakeholders.
- **Security Awareness:**
- **Security Principles:** Gain a foundational understanding of security principles and practices, such as how different sensors and alarms contribute to a comprehensive security solution.
- **Risk Assessment:** Understand potential vulnerabilities in a security system and how to mitigate them through design and programming.
- **Troubleshooting and Debugging:**
- **Issue Identification:** Develop skills in identifying and troubleshooting issues in both circuit design and programming.
- **Problem-Solving:** Learn to debug problems that arise during the design and implementation phases, such as connectivity issues or sensor malfunctions.
- **Simulation and Testing:**
- **Virtual Testing:** Use Tinkercad's simulation features to test and validate your designs virtually before physical implementation.
- **Scenario Analysis:** Test different security scenarios to ensure the system responds appropriately to various inputs and threats.

Conclusion

In developing this smart home security system using Tinkercad, I have gained comprehensive experience in designing and integrating electronic components, programming microcontrollers, and creating functional security solutions. My project involved the implementation of various sensors and actuators to build a system that effectively monitors and responds to security threats. I successfully integrated these components into a cohesive system, utilizing simulation tools to test and refine its performance.

This project not only honed my technical skills in electronics, circuit design, and programming but also enhanced my problem-solving abilities through troubleshooting and debugging. Additionally, I developed strong project management skills by planning, executing, and documenting the entire process.

Overall, this project has equipped me with practical experience in designing smart systems and has deepened my understanding of security principles, making me well-prepared to contribute effectively in the field of cybersecurity and system design.

Wix Link:

- https://sykesshakeem.wixsite.com/Tech-Portfolio