

Mini Project 1B Report
on
LASER SECURITY SYSTEM USING ARDUINO

By

Shraddheya Kadam B- 63TU2S2021007

Suraj Mane B- 87TU2S2021031

Omkar Thakare B- 86 TU2S2021030

Amol Gole B- 65 TU2S2021009

Under the guidance of
Prof. Deepak Kurule



Department of Electronics and Telecommunication Engineering

TERNA ENGINEERING COLLEGE

Plot no.12, Sector-22, Opp. Nerul Railway station,

Phase-11, Nerul (w), Navi Mumbai 400706

(UNIVERSITY OF MUMBAI)

TERNA ENGINEERING COLLEGE

Plot no.12, Sector-22, Opp. Nerul Railway station,

Phase-11, Nerul (w), Navi Mumbai 400706



CERTIFICATE

LASER SECURITY SYSTEM USING ARDUINO

Submitted by:

Shraddheya Kadam B-63 TU2S2021007

Suraj Mane B-87 TU2S2021031

Omkar Thakare B- 86 TU2S2021030

Amol Gole B- 65 TU2S2021009

Supervisor

Prof. Deepak Kurule

in fulfilment of the

Mini Project 1B of Second Year,

(SE Sem-IV) in Electronics & Telecommunication Engineering.

Mini Project Co-Ordinator

(Mr. Vijaypal Yadav)

Head of Department

(Dr. Jyothi Digge)

Principal

(Dr. L. K.Ragha)

Approval Sheet

Project Report Approval

This Mini Project Report – titled “**Laser Security System using Arduino UNO**” by following students is approved for the degree of **B.E. in "Electronics & Telecomm. Engineering"**

Submitted by:

Shraddheya Kadam B-63 TU2S2021007

Suraj Mane B-87 TU2S2021031

Omkar Thakare B- 86 TU2S2021030

Amol Gole B- 65 TU2S2021009

Examiner's Name & Signature:

1. _____

2. _____

Date: _____

Place: _____

Declaration

We declare that this written submission represents our ideas in my own words and where others' ideas or words have been included, we have adequately cited and referenced the original sources. We also declare that we have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in our submission. We understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

Shraddheya Kadam	B-63 TU2S2021007	_____
Suraj Mane	B-87 TU2S2021031	_____
Omkar Thakare	B- 86 TU2S2021030	_____
Amol Gole	B- 65 TU2S2021009	_____

Acknowledgement

We would like to express our sincere gratitude towards our guide **Prof. Deepak Kurule**, for their help, guidance and encouragement, they provided during the project development. This work would have not been possible without their valuable time, patience and motivation. We thank them for making our stint thoroughly pleasant and enriching. It was great learning and an honor being their student.

We are deeply thankful to **Dr. Jyothi Digge (H.O.D EXTC Department)** and entire team in the EXTC Department. They supported us with scientific guidance, advice and encouragement, they were always helpful and enthusiastic and this inspired us in our work.

We take the privilege to express our sincere thanks to **Dr. L. K. Ragha** our Principal for providing the encouragement and much support throughout our work.

Shraddheya Kadam B-63 TU2S2021007 _____

Suraj Mane B-87 TU2S2021031 _____

Omkar Thakare B- 86 TU2S2021030 _____

Amol Gole B- 65 TU2S2021009 _____

Date: _____

Place: _____

INDEX

Sr No.	Topic	Page No.
1	ABSTRACT	4
2.	INTRODUCTION 2.1 Need	5
3.	PROJECT CONSTRUCTION AND WORKING 3.1 Schematic Diagram for LASER Security System 3.2 Construction 3.3 Working	 6 7 8
4.	PROJECT SPECIFICATION 4.1 Components with features related to project 4.2 Arduino Code	 10 20
5.	CONCLUSION	21
6.	REFERENCES	22

1. ABSTRACT

Just consider the scenario that you are entering into any suspicious place and suddenly, by mistake, you interrupt an invisible LASER beam and an ALARM or SIREN blows. Nowadays this is a very common scenario. Many people secure their home, office, shops, warehouses, etc with the LASER beam security system. Not only buildings or premises, but many precious things like jewellery, diamonds, precious antique items in the museum, etc many other things are also secured using such invisible LASER beam.

In this system, there is an invisible LASER beam that is continuously ON and it is detected by any light sensor. Whenever any object or person comes in between LASER and sensor the beam interrupts and the sensor does not detect LASER light. And that's ALL!!!! As soon as the beam interrupts (cuts) the siren blows for intruder alert.

2. INTRODUCTION

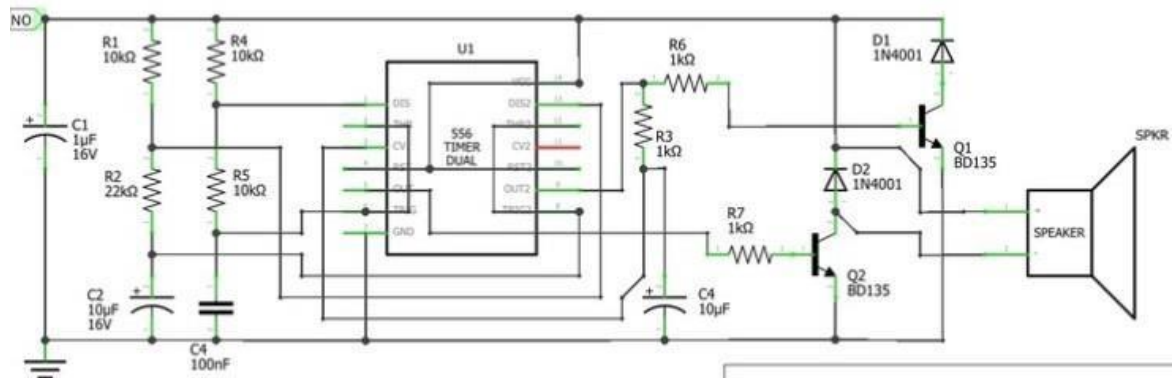
Our laser security system is designed in microcontroller based platform. Because microcontroller now brings a modern era to develop electronics project using a few component. Here we have used Arduino Uno R3 for this process. Arduino is now a popular microcontroller platform in the world.

2.1 Need :

We all want to live safely. So we always try to take necessary steps to keep it safe. Now a days there are a lot of electronic gadget can be found in market to increase the security of our home and office. Some of them is like CC TV Camera, Anti Theft Alarm, Smart Door locking system etc. But today we will show you a powerful Laser Security System.

3.PROJECT CONSTRUCTION AND WORKING

3.1 Schematic Diagram for LASER Security System



3.2 Construction:

LASER Security System Using Arduino

Connections:

LASER Diode -

+VE to 5V of Arduino

-VE to GND of Arduino

LDR based Light Sensor -

Vcc to 5V of Arduino

Out to PIN 7 of Arduino

3.3 Working :

At first Let's know how this project work. Basically in this project we are using a special kind of light which is known as laser light. Laser is a alphabetical name. The abbreviation of LASER is Light Amplified by Stimulated of Radiation. It means Laser is the enlargement of light. But laser is not as normal light. It is a monochrome light. The light is Sharp and Thick. The laser light waves are same size. The most important feature of this light is that these lights do not spread on the way as like as normal light. This ray can be go too far as it is highly concentrated and one-way.

Using this special power of laser rays, we will basically create our arduino laser security system. Many of you have heard about Dark Sensor. For those who did not listen, there is a photo diode in this dark sensor circuit called LDR (Light Depending Resistor). It works like a normal conductor when it lamps up on LDR. Again if there is darkness then electricity is prevented to flow. Using this feature of LDR, We will create a circuit using LDR which will sound when it is dark. Now we will set the target of laser dot on the LDR from a distance. So the laser light will fall on LDR. In this situation the circuit will not give any sound signal. But whenever anybody wants to cross the space between the laser light and the LDR, the laser ray will be interrupted to fall on the LDR. As a result, due to the absence of light, the circuit will give sound signal.

The project basically works on the principle of interruption. If by any means the laser light is interrupted the alarm will start unless it is reset with the pushbutton. The laser is a concentrated light source that puts out a straight beam of light of a single color.

The LDR is sensitive to light and puts out a voltage when the laser light hits it. When the laser beam is interrupted and can't reach LDR, its voltage output changes, and eventually the alarm will ring.

When powered ON this module emits Laser which follows a straight path. On its path LDR is at the other end. This Laser module and LDR together forms the monitoring section of this module. The Laser module and LDR should be in a place like door path, windows etc. And this is where when someone enters or intrude will interrupt the path of Laser and cut off the beam from falling over LDR.

LDR (Light dependent Resistor) is a component that reacts to light. The resistance of LDR will be very low when Laser beam falls on it whereas its resistance will be very high when Laser beam is cut off from it. The LDR is setup as a voltage divider where the change in resistance will alter the output voltage of this voltage divider. This voltage divider will give high voltage when Laser beam is incident on LDR. And when the beam is cut off by burglar or intruder the voltage out of divider will be very low.

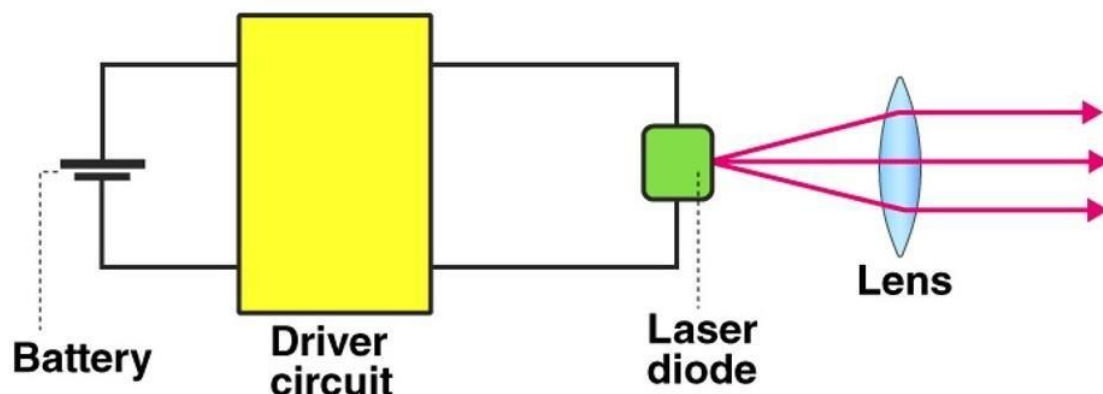
4 PROJECT SPECIFICATION

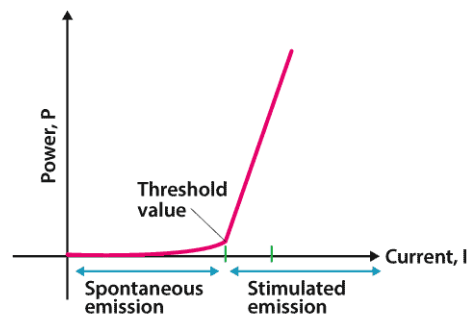
4.1 Components with features related to project

* Laser Diode

A laser diode, (LD), injection laser diode (ILD), or diode laser is a semiconductor device similar to a light-emitting diode in which a diode pumped directly with electrical current can create lasing conditions at the diode's junction. Laser diodes can directly convert electrical energy into light. Driven by voltage, the doped p-n-transition allows for recombination of an electron with a hole. Due to the drop of the electron from a higher energy level to a lower one, radiation, in the form of an emitted photon is generated. This is spontaneous emission. Stimulated emission can be produced when the process is continued and further generate light with the same phase, coherence and wavelength.

The choice of the semiconductor material determines the wavelength of the emitted beam, which in today's laser diodes range from infra-red to the UV spectrum.





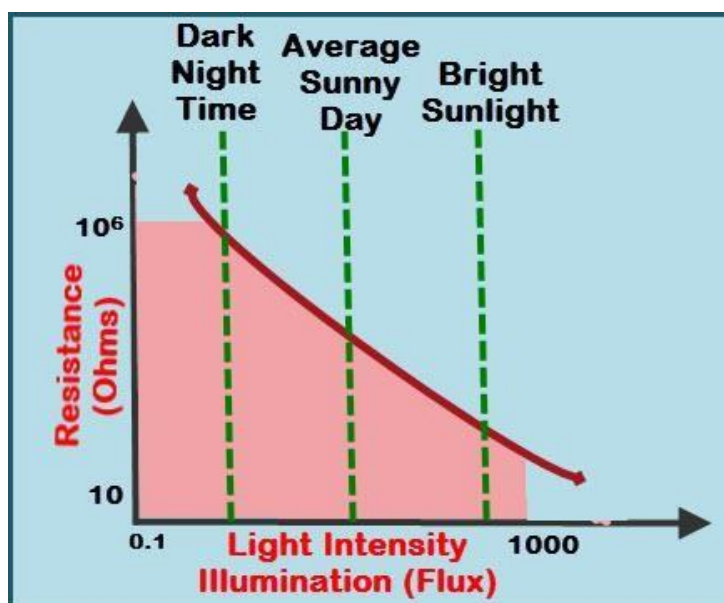
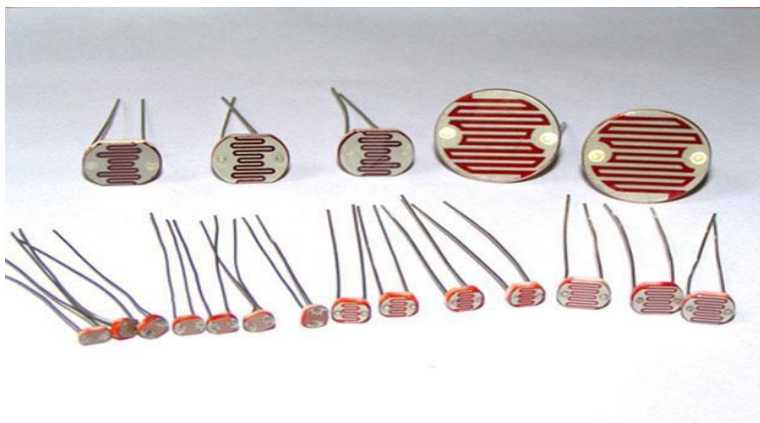
CHARACTERISTICS OF LASER DIODE

- Monochromatic: An insubstantial width of radiated narrow light containing only a single color.
- Well-directed: In this type, the light is will be directed in a narrow beam. It is easy to launch through an optical fiber.
- Coherent: A light with a single wavelength emitted by LED with a wide wavelength.
- The important characteristic of a laser diode is its approach or the threshold. The laser diode doesn't operate until a minimum power is applied. If the light is below its energy, then the emission is weaker than the threshold compared to the full energy.

* Light Sensor (LDR Based)

LDR is Light Dependent Resistor. LDRs are made from semiconductor materials to enable them to have their light-sensitive properties. There are many types but one material is popular and it is cadmium sulfide (CdS). These LDRs or PHOTO RESISTORS work on the principle of "Photo Conductivity". Now what this principle says is, whenever light falls on the surface of the LDR (in this case) the conductance of the element increases or in other words, the resistance of the LDR falls when the light falls on the surface of the LDR. This property of the decrease in resistance for the LDR is achieved because it is a property of semiconductor material used on the surface.

A high resistance Semiconductor material called cadmium sulfide cells, highly sensitive to visible and near-infrared light.



As its name suggests, photoresistors work similarly to your regular resistors, but instead resistance change is dependent on the amount of light it's exposed to. High intensity of light causes a lower resistance between the cadmium sulfide cell. The low intensity of light results in a higher resistance between the cadmium sulfide cells. This working principle can be seen in applications such as street lamps, wherein the day, the higher light intensity results in lower resistance and no light produced.

Working of LDR controlled LED using Arduino

As per the circuit diagram, we have made a voltage divider circuit using LDR and 100k resistor. The voltage divider output is feed to the analog pin of the Arduino. The analog Pin senses the voltage and gives some analog value to Arduino. The analog value changes according to the resistance of LDR. So, as the light falls on the LDR the resistance of it get decreased and hence the voltage value increase.

Intensity of light ↓ - Resistance ↑ - Voltage at analog pin ↓ - Light turns ON

As per the Arduino code, if the analog value falls below 700 we consider it as dark and the light turns ON. If the value comes above 700 we consider it as bright and the light turns OFF.

Working of LDR controlled LED using Arduino

As per the circuit diagram, we have made a voltage divider circuit using LDR and 100k resistor. The voltage divider output is feed to the analog pin of the Arduino. The analog Pin senses the voltage and gives some analog value to Arduino. The analog value changes according to the resistance of LDR. So, as the light falls on the LDR the resistance of it get decreased and hence the voltage value increase.

Intensity of light ↓ - Resistance↑ - Voltage at analog pin↓ - Light turns ON

As per the Arduino code, if the analog value falls below 700 we consider it as dark and the light turns ON. If the value comes above 700 we consider it as bright and the light turns OFF.

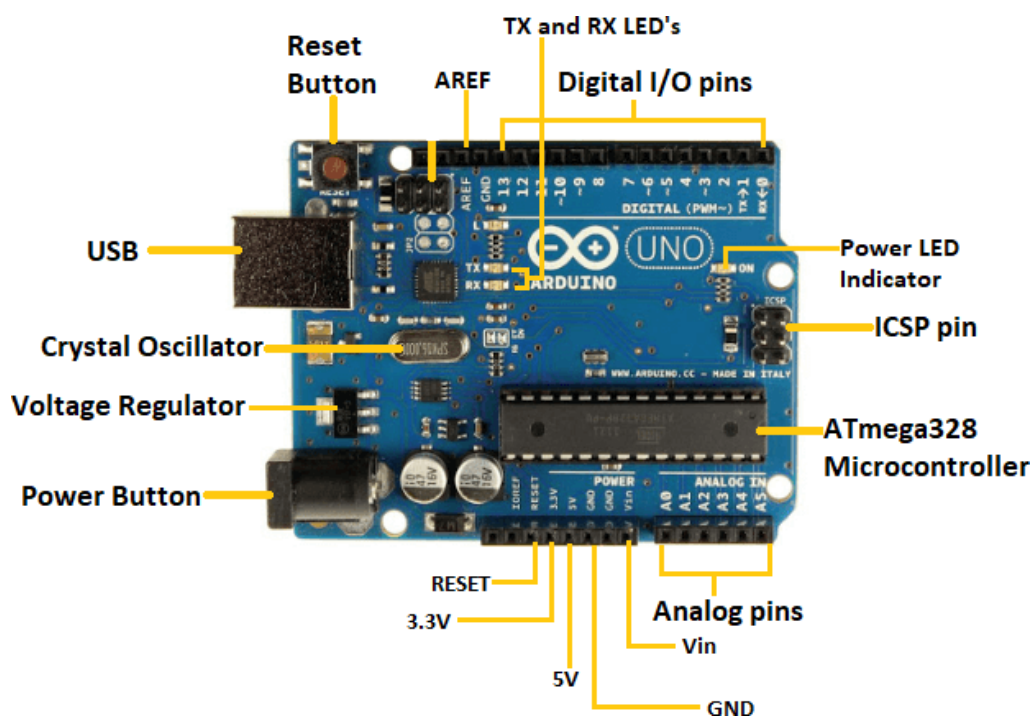
* Arduino UNO

The IDE is common to all available boards of Arduino.

The Arduino board is shown below:



The components of Arduino UNO board are shown below:



Let's discuss each component in detail.

- **ATmega328 Microcontroller**- It is a single chip Microcontroller of the ATmel family. The processor code inside it is of 8-bit. It combines **Memory (SRAM, EEPROM, and Flash), Analog to Digital Converter, SPI serial ports, I/O lines, registers, timer, external and internal interrupts, and oscillator.**
- **ICSP pin** - The In-Circuit Serial Programming pin allows the user to program using the firmware of the Arduino board.
- **Power LED Indicator**- The ON status of LED shows the power is activated. When the power is OFF, the LED will not light up.
- **Digital I/O pins**- The digital pins have the value HIGH or LOW. The pins numbered from D0 to D13 are digital pins.
- **TX and RX LED's**- The successful flow of data is represented by the lighting of these LED's.
- **AREF**- The Analog Reference (AREF) pin is used to feed a reference voltage to the Arduino UNO board from the external power supply.
- **Reset button**- It is used to add a Reset button to the connection.
- **USB**- It allows the board to connect to the computer. It is essential for the programming of the Arduino UNO board.
- **Crystal Oscillator**- The Crystal oscillator has a frequency of 16MHz, which makes the Arduino UNO a powerful board.
- **Voltage Regulator**- The voltage regulator converts the input voltage to 5V.
- **GND**- Ground pins. The ground pin acts as a pin with zero voltage.
- **Vin**- It is the input voltage.
- **Analog Pins**- The pins numbered from A0 to A5 are analog pins. The function of Analog pins is to read the analog sensor used in the connection. It can also act as GPIO (General Purpose Input Output) pins.

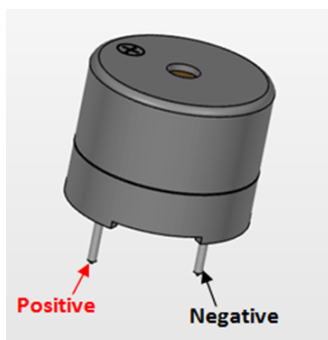
Arduino/Genuino Uno is a microcontroller board based on the ATmega328P ([datasheet](#)). It has 14 digital input/output pins (of which 6 can be used as PWM outputs), 6 analog inputs, a 16 MHz quartz crystal, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with a AC-to-DC adapter or battery to get started.. You can tinker with your UNO without worrying too much about doing something wrong, worst case scenario you can replace the chip for a few dollars and start over again.

* Buzzer

A buzzer is a small yet efficient component to add sound features to our project/system. It is very small and compact 2-pin structure hence can be easily used on breadboard, Perf Board and even on PCBs which makes this a widely used component in most electronic applications.

There are two types of buzzers that are commonly available. The one shown here is a simple buzzer which when powered will make a Continuous Beeeeeeppp.... sound, the other type is called a readymade buzzer which will look bulkier than this and will produce a Beep. Beep. Beep. Sound due to the internal oscillating circuit present inside it. But, the one shown here is most widely used because it can be customised with help of other circuits to fit easily in our application.

This buzzer can be used by simply powering it using a DC power supply ranging from 4V to 9V. A simple 9V battery can also be used, but it is recommended to use a regulated +5V or +6V DC supply. The buzzer is normally associated with a switching circuit to turn ON or turn OFF the buzzer at required time and required interval.



PIN Configuration

Pin Number	Pin Name	Description
1	Positive	Identified by (+) symbol or longer terminal lead. Can be powered by 6V DC
2	Negative	Identified by short terminal lead. Typically connected to the ground of the circuit

4.2 Arduino Code

```
laser security system Ardiuno CODE - Notepad
File Edit Format View Help
void setup()
{
    // put your setup code here, to run once:
    pinMode(11,OUTPUT); //Buzzer Pin
    pinMode(7,INPUT); // Light Sensor
    delay(500);
}

void loop()
{
    // put your main code here, to run repeatedly:
    int i=0;
    if(digitalRead(7)==HIGH)
    {
        a:
        digitalWrite(11,HIGH);
        delay(100);
        digitalWrite(11,LOW);
        delay(100);
        i++;
        if(i<50)
        {
            goto a;
        }
    }
}
```

5 CONCLUSION

Laser security system provides us the security against any crime, theft in our day to day life and so people are installing them in order to stay safe, secure and sound. Various electronic security systems can be used at home and other important working places for security and safety purposes. It is a great opportunity and source of saving man power contributing no wastage of electricity. The "Laser Security System" is an important helping system. Using this system robbery, thefts & crime can be avoided to large extend. Avoiding thieves results in the safety of our financial assets and thereby this system provides us protection against all.

The Laser & LDR system is highly sensitive with a great range of working. The system senses the light emitted by the Laser falling over the LDR connected with the circuit. Whenever the beam of light is interrupted by any means, it triggers the alarm or siren. This highly reactive approach has low computational requirement, therefore it is well suited to surveillance, industrial application and smart environments.

6 REFERENCES

- **The 8051 Microcontroller and Embedded Systems: Using Assembly and C.**
- **Arduino : The Complete Beginner's Guide - Step By Step Instructions (The Black Book).**
- **Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform.**
- **Electronic Circuit Analysis and Design, 2nd Ed. by Donald A. Neamen.**
- <https://www.engineersgarage.com/>
- <https://techfestibal.com/>.
- <https://www.seeedstudio.com/>
- <https://www.instructables.com/>