

# LASER-BASED PASSWORD-PROTECTED SECURITY SYSTEM

## PROJECT OVERVIEW

This project is a smart security system that combines laser tripwire detection, password-based access, and sensor-based intrusion alerts using an Arduino. It is ideal for home or lab safety and demonstrates both hardware interfacing and real-time data.

### WORKING PRINCIPLE

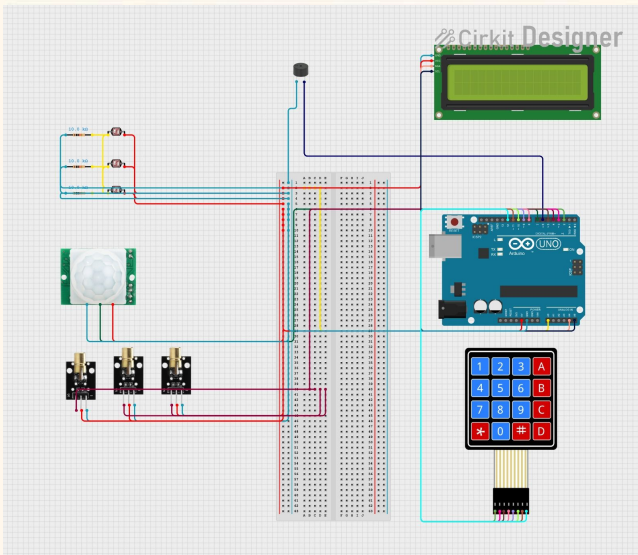
The system is a smart security system that combines laser tripwire detection, password-based access, and sensor-based intrusion alerts using an Arduino.

It activates an alarm if an intrusion is detected.

- > Laser + LDR pair as light interruption sensor (tripwire)
- > PIR motion sensor to detect intrusion
- > Incorrect password or RFID tag is used
- > Appropriate alarm or accord analysis using Python GUI

It activates (alarms if threats are detected):

- > System starts in secure mode.
- > Laser + LDR; if beam is broken.
- > Incorrect password or RFID tag is used.



## ➔ HOW IT WORKS

1. System starts in secure mode.
2. Laser + LDR: If beam is broken, and no correct password is entered, the buzzer is activated.
3. PIR Sensor: If motion is detected and the system is armed, the alarm sounds.
4. Keypad: Entering the correct password disarms the system. Incorrect attempts: Triggers alarm or activates a lockout after multiple failures.
5. All actions are shown on the LCD for user guidance.

## CORE CONCEPTS & TECHNOLOGIES

Component	Description / Function
Arduino Uno	Microcontroller board that controls the entire security system.
Laser Module	Emits a continuous laser beam, acting as the tripwire.
LDR Sensor	Detects interruption in the laser beam.
PIR Motion Sensor	Detects motion and triggers alerts if system is armed.
Keypad (4×4)	Allows users to input a password.
LCD Display (I2C)	Displays system status, alerts, and user guidance.
EEPROM	Stores password permanently to retain data.
Buzzer	Provides audio alert upon intrusion or incorrect password.
Relay Module	Controls power to devices such as lasers or alarms.
Power Supply	Supplies regulated power to all components.

### APPLICATIONS

1. Home security
2. Server room security
3. Warehouse safety
4. Vault protection
5. Museum or lab entry systems

## DATA LOGGING AND ANALYSIS

- Serial communication to Python GUI (Tkinter)  
Stores timestamped intrusion events (LDR, PIR)
- Analyzes patterns (e.g., retroactive time of day)
- Graphical display of sensor data over time (using matplotlib)

