

PROJECT

Internship cum Training

on

Embedded System Design

using

Arduino IDE & Micropython

Jointly organized by



Submitted by

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EEE - B / II - Year / 3rd - Semester

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LEARNINGS DETAILS

S.No	Date	Sessions	Topics Learned & worked
1	11/09/22	1	Introduction to Embedded System
2	11/09/22	2	Microcontrollers and Microprocessors
3	18/09/22	3	System Design
4	18/09/22	4	Digital Signal Processing
5	02/10/22	5	VLSI Architecture Design
6	02/10/22	6	VHDL Architecture Design and Methodologies

7	03/10/22	6 (Continuation)	Embedded System in Arduino Uno Using 'C' Language
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LEARNINGS DETAILS

S.No	Date	Sessions	Topics Learned & worked
8	09/10/22	7	Real Time Operating Systems
9	09/10/22	8	Architecture and Design of Distributed Embedded System
10	15/10/22	9	Data Communication and Networks
11	16/10/22	10	Embedded Wireless Sensor Networks
12	30/10/22	11	FPGA Based Design

13	30/10/22	12	Embedded Networking
14	06/11/22	13	Wireless and Mobile Communication
15	06/11/22	14	Embedded Control Systems

PROJECT DETAILS

Digital Door Lock

1.1 ABSTRACT:

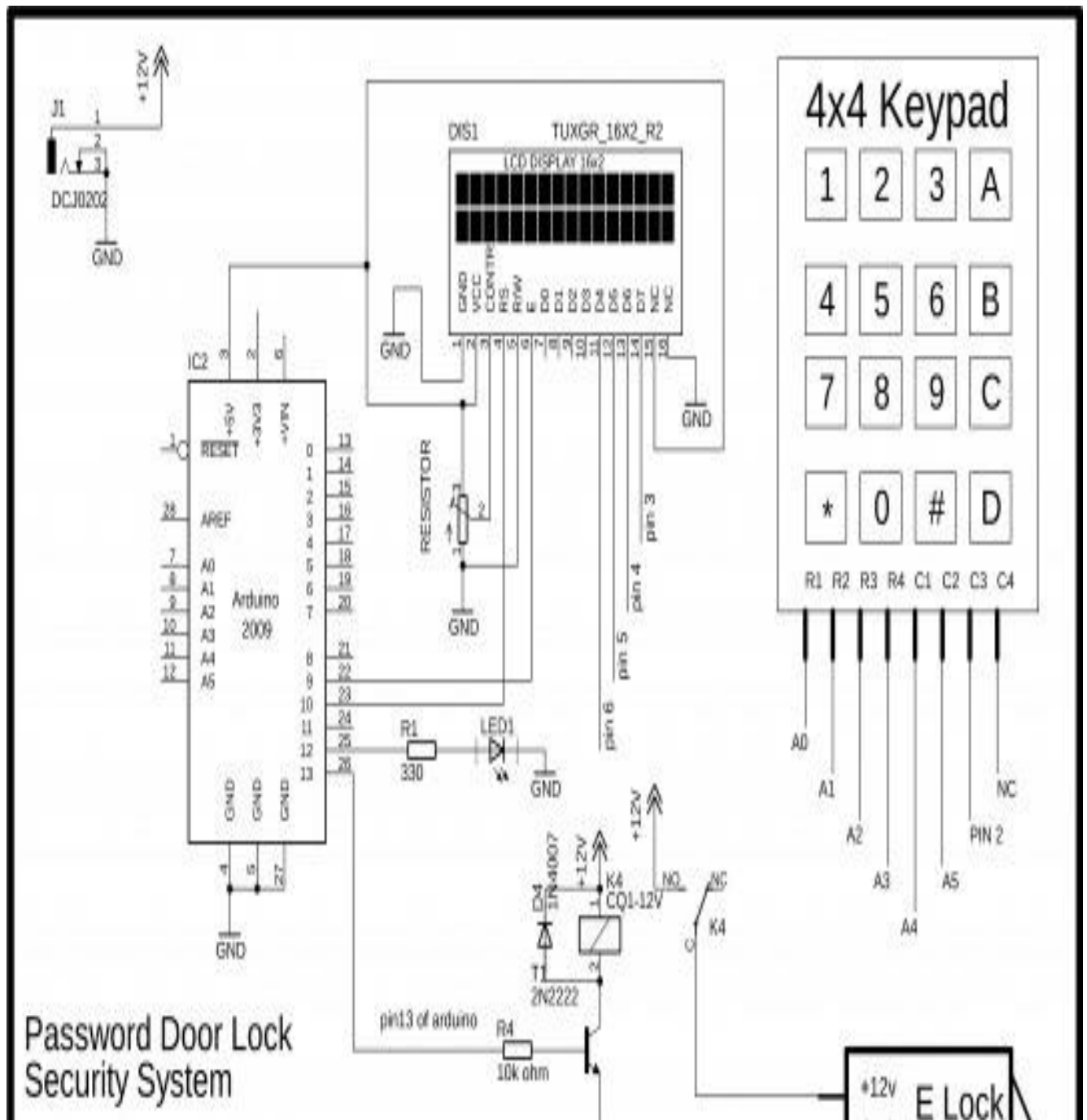
I made a smart digital door lock system for home automation. A digital door lock system is equipment that uses the digital information such as a secret code, semi-conductors, smart card, and finger prints as the method for authentication instead of the legacy key system. In our proposed system, a ZigBee module is embedded in digital door lock and the door lock acts as a central main controller of the overall home automation system. Technically, our proposed system is the network of sensor nodes and actuators with digital door lock as base station. A door lock system proposed here consists of RFID reader for user authentication, LCD Display, motor module for opening and closing of the door, sensor modules for detecting the condition inside the house, communication module, and control module for controlling other modules. Sensor nodes for environment sensing are deployed at appropriate places at home. Status of individual ZigBee module can be monitored and controlled by the centralized controller, digital door lock. As the door lock is the first and last thing people come across in entering and leaving the home respectively, the home automation function in digital door lock

system enables user to conveniently control and monitor home environment and condition all at once before entering or leaving the house. Furthermore, it also allows users to remotely monitor the condition inside the house through Internet or any other public network. The biggest advantage of our proposed system over existing ones is that it can be easily installed when and where necessary without requirement of any infrastructures and proper planning.

1.2 OBJECTIVES :-

- 1. To design a low cost digital door lock.**
- 2. To prevent or reduce theft attempts.**
- 3. To provide security using a resettable password
Based Locking System.**
- 4. To help handicapped person to open the door using
Remote.**

1.3 CIRCUIT/BLOCK DIAGRAM



1.5 EXPLANATION OF HARDWARE MODULES

This work proposes a digital door locking system using IR technology. The project uses very simple components and hardware circuits which are easy to design. The design consists of two sections i.e, Transmitter section and receiver section.

Transmitter:

There are two types of IR communication.

i) Point-to-Point: It requires a line of sight between the transmitter and a receiver. That is the transmitter and the receiver should be pointed to each other and there shouldn't be any obstacles between them. Example: Remote control communication.

ii) Diffuse Point: In this communication, it doesn't require any line of sight and the link between the transmitter and the receiver is maintained by reflecting or bouncing of the transmitted signal by surfaces like ceilings, roof, etc. Example: Wireless LAN communication system.

In the present work point-to-point communication is considered. The remote acting as an IR transmitter consists of a 4×3 keypad, a microcontroller and an IR LED.

The purpose of remote is to enter the password for unlocking the solenoid lock at the receiver end.

Receiver:-

The IR receiver is a photo detector that is sensitive to light and it filters other light frequencies except IR light.

The photo detector develops an output electrical signal as light is incident on it. The output of the detector is filtered using a narrow band filter that discards all the frequencies below or above the 38 KHz carrier frequency.

In TSOP1838 IR receiver a PIN diode and a preamplifier are assembled on a lead frame while the epoxy package acts as an IR filter. The demodulated output signal from IR filter is decoded by the microcontroller.

If the password received or entered is authenticated then the door is unlocked through solenoid else the information is displayed on LCD "IR PWD mismatch", if incorrect password is received or entered three times then the receiver enters into sleep mode.

The receiver also has flexibility in changing the password if the password is stolen or shared.

Prototype:

Using the IR technology and Arduino Uno microcontroller concept the final working prototype was developed.

Methodology:

The main idea of designing the password based locking system is to provide many modern security features than mechanical lock.

It comprises a small electronic unit which is fixed at the entry door to control a solenoid-operated lock.

When an authorized person enters predetermined user password via IR remote keypad, the solenoid-operated lock will be unlatched so the door can be open.

At the end of preset delay time, the solenoid latch will again move in opposite direction and the door gets locked again.

When the password has been incorrectly entered three times in a row, the code lock will switch to block mode, this function thwarts any attempt by hackers to quickly try a large number of passwords in a sequence.

The project intends to interface the microcontroller with the solenoid lock and start/stop the solenoid by sending the predefined messages from the controlling unit.

The software application and the hardware implementation help the microcontroller read the messages sent by the user from the remote and accordingly change the status of the solenoid required.

The measure of efficiency is based on how fast the microcontroller can detect the incoming message and act accordingly.

The system is totally designed using IR remote and embedded systems technology.

The controlling unit has an application program to allow the microcontroller read the incoming data through the remote as per the requirement.

The performance of the design is maintained by the controlling unit.

1.6 BUDGET

S.No.	Component Name	Quantity	Unit Cost	Cost
1.	Arduino Uno	1	₹ 1,120	₹ 1,120
2.	4*4 Keypad	1	₹ 126	₹ 126
3.	IR LED	1	₹ 12	₹ 6
4.	LCD Display	1	₹ 112	₹ 112
5.	Solenoid Lock	1	₹ 272	₹ 272
6.	Bread Board	1	₹ 60	₹ 60
7.	IR Receiver	1	₹ 25	₹ 25
8.	Relay	1	₹ 67	₹ 67
9.	Buck Converter	1	₹ 225	₹ 225
10.	12V DC Adapter	1	₹ 100	₹ 100
11.	Battery	1	₹ 190	₹ 190
Total Cost				₹ 2,303

1.7 WORK FLOW

Steps implemented by Coded Program

1. The first step is to initialize the counter to zero.
2. This counter corresponds to the number of times the password to be entered to gain access to door.
3. Once the counter is set, four digit password is sent through the IR Remote.
4. The IR receiver receives the transmitted password.
5. If the received password is correct, door is unlocked else count is incremented by one.

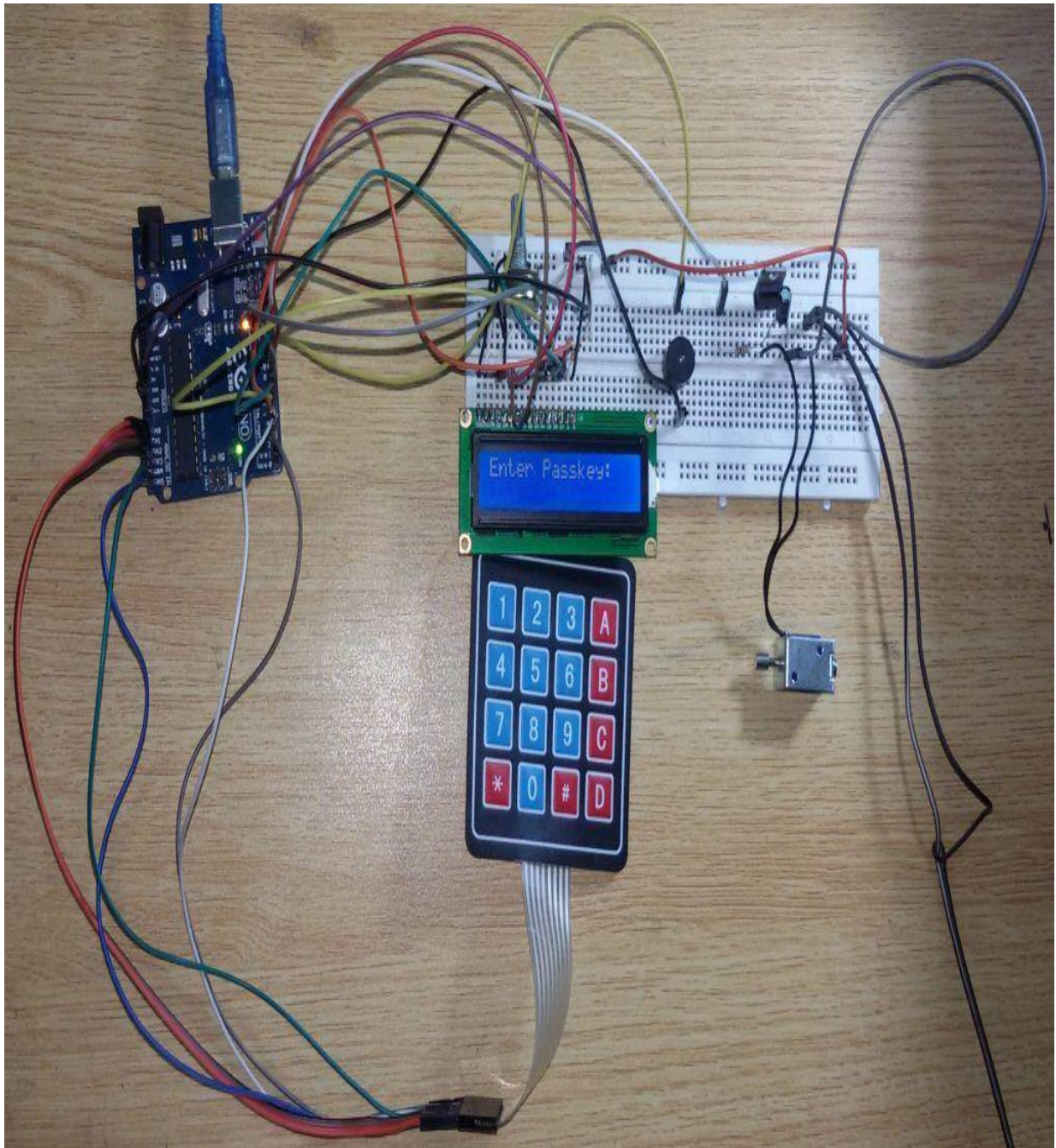
6. If the count is not equal to three, password can be re-entered again else if count is equal to three, the system enters into sleep mode for 30 seconds then the count will be re-initialized to zero.
7. Here 30 seconds time is considered for demonstration purpose.
8. This time can be as long as possible or reprogrammed by the designer.

1.8 WORK DONE CHART:

S. No.	Date	Works carried out
1.	08/11/2022	Components Purchased
2.	11/11/2022	Connections are made
3.	15/11/2022	Circuit Connections Completed
4.	16/11/2022	Project Tested and Verified

1.9 RESULT

Completely Designed and Implemented " Digital Door Lock Project "



1.10 FUTURE SCOPE

This prototype developed can be further enhanced in future by following ways:

1. In case password being forgotten, GSM based technology can be used to send One Time Password (OTP) to the authorized person or fingerprint based system can be used.

This technology has not been implemented in the present case looking into cost consideration.

2. A rechargeable battery can be used in place of 9V battery in the IR remote which eliminates the need of replacing battery frequently.

3. Designing a DC supply at the receiver to switch from AC supply during mains failure.

4. For giving more security to the system, encryption can be implemented in data transmission

so that password hacking cannot be done easily.

1.11 CONCLUSION

The following conclusions are drawn from the work carried out:

1. The purpose of this proposed system is to build a low cost digital door lock operated by an IR remote controller.

2. This system can be used in the places where security is required to prevent theft attempt.

3. This system provides option for resetting of password which helps user to change the password whenever required.

4. System can be operated by handicapped person to open door from distance under 10ft.

5. It can be used in the lockers and other protective doors.

FEEDBACK ABOUT PROJECT AND INTERNSHIP :-

During this internship period, my desire to develop in this area has grown, thanks to interesting tasks and the admirable Project Contest team. I am sure that during the internship at Project Contest, I gained not only invaluable knowledge and experience, but also essential practical skills. Thank you for the fascinating internship! I sincerely wish Project Contest Team for further professional success, growth and prosperity!