



# **Server Operated Advance Entry-Exit Monitoring System Based on RFID**

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**ABSTRACT:** This project is developed using Radio Frequency Identification (RFID) reader and ATMEGA-328 Microcontroller to design a local user interface based attendance system along with entry-exit control and monitoring. The main objective of this project is to implement a student entry-exit control and monitoring system for secure and reliable applications. The developed system gives all types of information regarding student library details, in-out track record, attendance details which can be utilized for future reference. In this project, both the hardware and software modules are integrated. The hardware module includes a Passive RFID reader, ATMEGA-328 microcontroller, LCD etc. The benefits associated with applying passive RFID is that it capacities and not using a power supply and passive tags are lighter and are less expensive than the active tags .The software module uses sql server 2000, which is designed in such a way that the hardware system is interfaced, controlled and monitored from the computer with a dot net based Graphical User Interface (GUI). The primary purpose of the project is to authenticate entry-exit of each student .The system enables student to check-in and check-out under fast, protected and reliable conditions. The software module also includes a facility to update, edit or delete any record for future use so that if any students want to exit earlier for urgent work then administrator updates their record by this function.

**KEYWORD:** RFID based system, entry-exit system, embedded systems, GUI (Graphic User Interface)

## **I. INTRODUCTION**

The identification of persons is increasingly important in places such as airports, railway stations, theatres etc. There are several methods for automatic-identification; some of them are systems of barcodes, optical character recognition, biometrics, smart cards and RFID, RFID technology is a revolution. Radio frequency identification (RFID) is most popular among identification technologies because of its low cost, light weight, reduced size as well as low cost maintenance. Due to the recognition of RFID in the area of manufacturing, retail store, medication as well as logistics, it is now in consideration for use in different areas like common computing, health care, agriculture, transport and security. Nowadays safety, power conservation and scalability are one of the top issues that have been consideration intended for designing projects. In this particular project, all of us consider your stated concerns as well as present just how growing technological know-how connected with RFID can be used intended for developing a intelligent university. The system includes maintaining attendance record, library records, authorized entry-exit of students. Results show that consumption of energy and student tracking time is decreased while security of students and credibility of attendance record are increased.

### **Advance Features of Developed System**

There are different kind of entry-exit control systems are used in organization having several functionality & feature, but in our developed system some important & unique features are incorporated specially related to student attendance and exit information these are:-

- To keep the daily “entry-exit” record of student of an institute in centrally distributed and networked environment.
- Display the identity of the person on different remote host with the help of their tag ID.
- Database logging of the IN- OUT time & total duration of any student per day.



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- Automatic monthly report generation of any student which includes relevant record.
- The software designed by us also includes information about the library related issue of the student.
- Application software development with suitable GUI to database maintenance.

## Related Work

The related works has been mentioned [1, 2, 3, 4]. In paper [1], they have applied a digital safety measures system which contains door secure system making use of passive RFID. A centralized system has been for handling along with transactions. The doorway locking system functions instantly any time anyone taps the particular credit card in contact with the particular target audience, the threshold clears and also the information can be kept within core server in addition to essential information on the person. RFID technologies can be useful to provide option for secure access of a area though retaining report on the person. The paper [2] proposes data base technology and logic to automatically generate reports on the existence monthly employee activities. They also discussed about why & how SMTP code can help in the development of automatic e-mail delivery feature for the monthly report to the concerned person. In paper [3] it has implemented a simple security system which uses RFID module which reads data in the card and LCD which is used to display the data in the card. The RFID module indicates a buzzer whenever it reads the data from the RFID card. In paper [4] system combines RFID technology and biometrics to perform the required task .The main aim of system is to capture the user image and scans the database for a match, system also uses GSM modem for emergency call so that suspicious persons can be caught.

Referring to the Literature survey in Paper [3], our work is extended to design PC and microcontroller based attendance system and entry-exit control system using RFID technology. The system accomplishes the entry and exit control task by the RFID tags. The system includes entrance monitoring system and exit monitoring embedded system with password protected. This system control and monitor the entry-exit of person by PC based software and this system will not only monitor the entry-exit time but it will also show the library details of student. Hence this project can be very useful for colleges and can be implemented in real time applications for recording the attendance , paper work of gate pass can be reduced.

## II. SYSTEM MODEL DEVELOPMENT

The block diagram of the entire system is given below in fig 1. The system comprises of two separate systems, one which is installed at the side of the faculty and other which is installed at the gate. The RFID card that we are using is rewritable, i.e. the data can be read as well as can be written to the card without any problem. In our system, the card is being read/write at the department side only, at the gate side system, the card is only being read for particular value and the data is displayed.

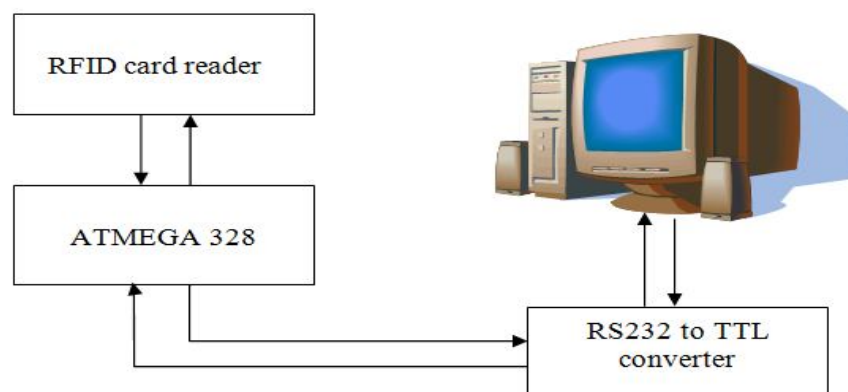


Fig.1 Block Diagram of the system at faculty side



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Above figure shows the block diagram of hardware circuit which is connected with the user interface by serial port.

At the department side system, first the system prompts the faculty to enter password, unless the password is entered the system remains inactive. As soon as the password is entered the system starts and displays the relevant date and time. Now after this whenever the card is swapped then the corresponding information about the student is displayed. If the data for that particular card does not exist then in that case, the faculty can enter the information about the student. In addition to this the system automatically writes the status of student (entry/exit) on to his/her card so that when he/she exits the premises, the card could be checked there.

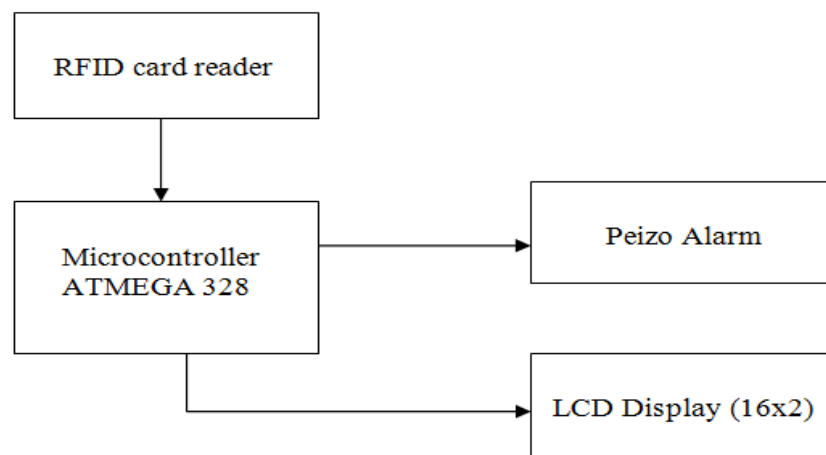


Fig.2 Block Diagram of the system at Gate Keeper side

Figure 2 shows the block diagram of exit system which is at gate keeper side which consist of RFID reader(MFRC522), Microcontroller ATMEGA 328 based on AVR enhanced RISC architecture with on-chip debugging support and programming, display device (LCD), Alarm used for invalid entry. The RFID reader is main part of the system, it is highly integrated reader/writer IC for contact less communication at 13.56 MHz operating frequency. The host interface provided by this reader is Serial Peripheral interface (SPI). A serial peripheral interface (SPI compatible) is supported to enable high-speed communication to the host. The interface can deal with data speeds up to 10 Mbit/s. An interface compatible with SPI enables high-speed serial communication between the MFRC522 and a microcontroller

### III. SYSTEM INITIALIZATION

To initialize the system it is required to explain the software implementation, algorithm and flowchart of hardware and software module.

#### *Software Implementation*

Software Implementation is done in two parts:

1. We implemented microprogramming using Arduino 1.6.3 platform for hardware modules.

Arduino is an open-source prototyping platform based on hardware and software. Arduino boards are able to read inputs - light on a sensor, a finger on a button, or a Twitter message - and turn it into an output - activating a motor, turning on an LED, publishing something online. All this is defined by a set of instructions programmed through the Arduino Software (IDE).



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The following are the algorithm and flowcharts used in hardware module.

### *Algorithm to record time of entry and library details with flowchart*

- Step1: Start the process
- Step2: Initialize the module
- Step3: Now RFID module wait for new card
- Step4: RFID reader send a UID to serial port which is a unique id given by company to card.
- Step5: Now store the feedback to card and this feedback is given by software module
- Step6: After this loop is repeated in infinite from wait for card to store feedback to card. This feedback will receive from PC.

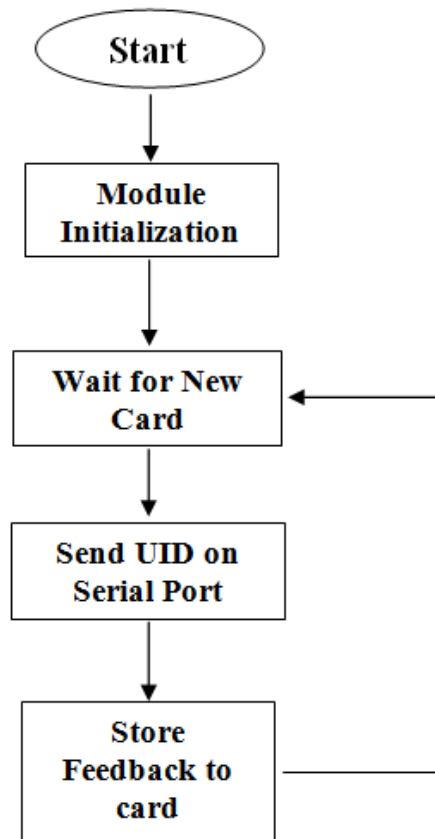


Fig.3 Flowchart of hardware system to record entry time and other details

### *Algorithm and flowchart of system for exit which is at Gate keeper side*

- Step1: Start the process
- Step2: Initialize the module
- Step3: Now RFID reader wait for new card
- Step4: Check card status is valid or not
- Step5: If user's card status is valid then it means exit is permitted by respective head of department and if card status is invalid then loop will again go through wait for card.

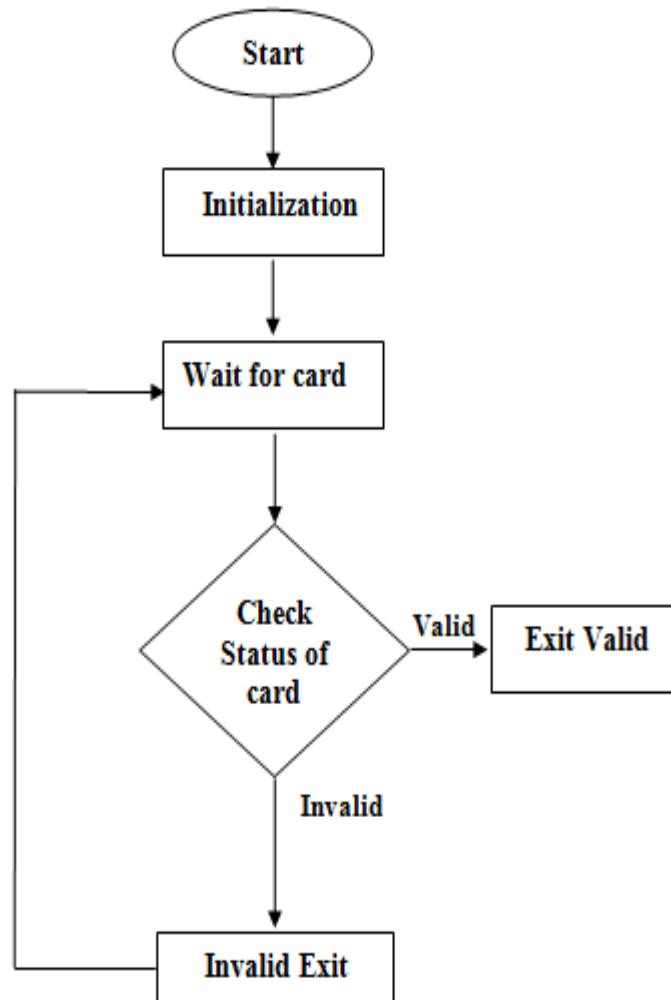


Fig.4 Flowchart of exit system which is at Gate keeper side

2. We implemented the communication protocol using .net programming language with Mysql database. We provided a front-end GUI for student attendance, entry-exit control, update/delete user list, to record other library details etc and for back-end we used MySQL database, where we created a table in order to store user information.
  - a) Reading the card ID number through USB port of PC.
  - b) Extracting the card ID number from the stream of data by discarding the start and stop bits.
  - c) Storing the extract number on Mysql database during student attendance.

During Verification of user if the enrolled user tapped the card again, that will be authenticated and the message will be displayed on the system. The tables used for database design includes creating MY SQL database and linked with Visual Studio 2008.



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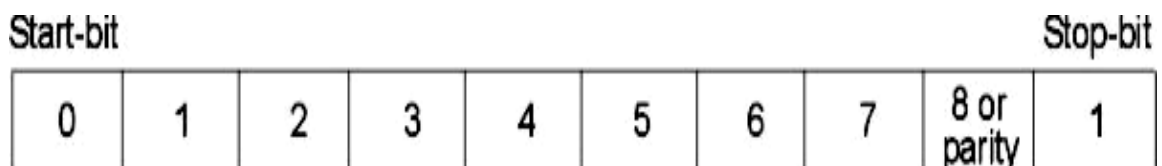
Reading card ID Number

1. The card number from the reader is obtained by programming the serial port according to the communication protocol.

Port Name	COM#
Baud Rate	9600
Data Bits	8
Parity2	None
Stop Bit3	1
Flow Control	None

Table 1: Communication Protocols

2. Com Port number may vary depending upon the system and port used (COM3/4/5....)
3. Baud rate – The baud rate is the number of times per second a serial communication signal changes states; a state being either a voltage level, or a frequency, or a frequency phase angle.
4. Parity Bits – The parity bit, unlike the start and stop bits, is an optional parameter, used in serial communications to determine if the data character being transmitted is correctly received by the remote device .



## Algorithm of Software Module

- Step1: Start the process
- Step2: Check RFID connection
- Step3: If RFID is connected then wait for new card else come back to connection check.
- Step4: Check Unique id(UID) in database. In this step system will check whether tapped UID is present in database or not.
- Step5: If UID is present in database then show details of card else save new card name and loop will come back to wait for card.
- Step6: Check Mode; there are two modes in the system that is entry mode and exit mode.
- Step7: If entry mode is selected then save details of entry and make card status invalid for exit
- Step8: For exit mode, check exit time
- Step9: If exit time is valid then status of card will changed to valid and exit time will save.
- Step10: If exit time is invalid then in this case process will stop and come back to wait for card and if any student want to go urgently before standard exit time then in this case only admin can update exit time of that particular student card and then record will save.



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## IV. RESULT

### Analysis and Discussions

Following are the final steps to control and monitor the entry-exit of students by server based User interface

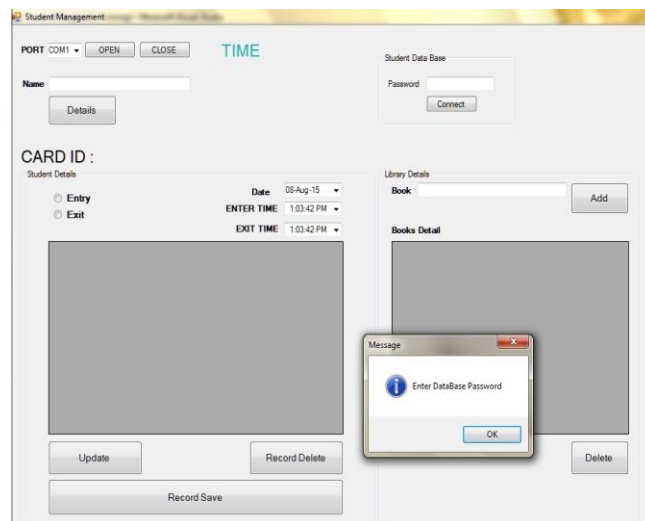


Fig.5 Screenshot of the graphical user interface (Step 1)

In first step when we connect system to computer above window will open, now message box will open to enter the password which will be entered only by selected administrator of system.

Here 'Connect' button is used to connect the GUI to system and 'Open' button is used to open the serial port and 'Close' button is used to close the same port.

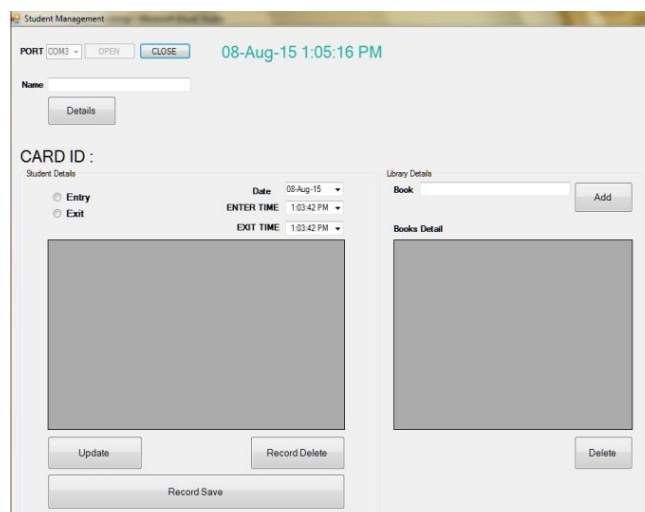


Fig.6 Screenshot of the graphical user interface (Step 2)

In second step when head of department or other administrator of system enter the password and open the available com port then software module is connected to hardware and respective date and time will shown on the GUI. In

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library details section there are two buttons used. 'Add' button is used to add issued book details of student specified in Name textbox. Similarly 'Delete' button is used to delete the book details of particular student.

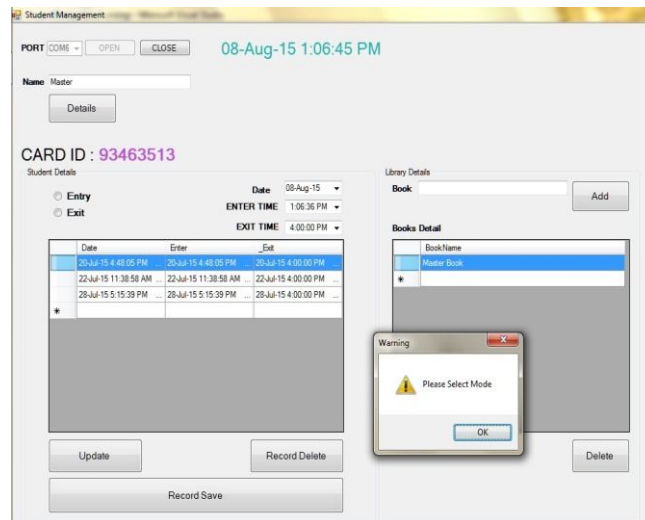


Fig.7 Screenshot of the graphical user interface (Step 3)

Now as shown in above figure when student will tap their card then again message box will open to select the mode that is entry or exit mode. In Student details section three buttons are used that is Update, Record Save, and Record Delete. These are buttons used for student details. Here 'Update' Button is used to update the student entry-exit detail it means if admin of system wants to change or edit the entry or exit time in previous record then he/she can use this Update button. And after doing this changes 'Record Save' button can be used to save updated details. So 'Record Save' button is used to save changes done by administrator. Now 'Record Delete' button is used to delete the entry-exit details of selected student.

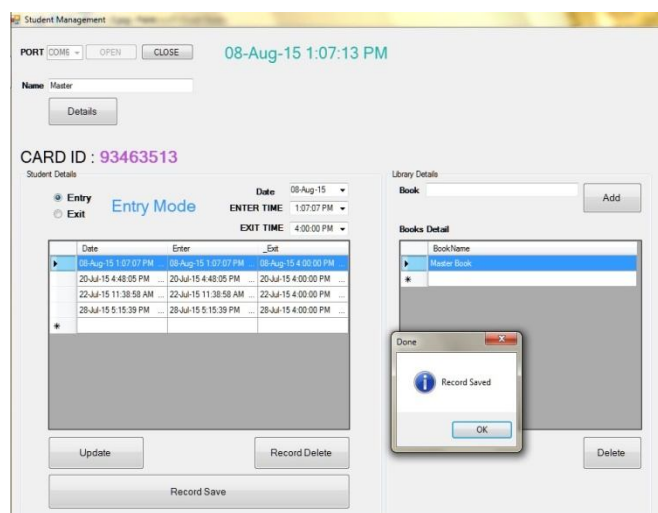


Fig.8 Screenshot of the graphical user interface (Step 4)

Finally in step 4 shown in above figure, after mode is selected by Head of Department or other administrator, if record of that particular card is saved in database then their entry or exit record of that particular day will be recorded successfully and their library record too. Admin of system can also update, delete and record all details of student.



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Apart from this if in case of new UID which is not in database then again a message box of new student will open and in this case HOD has to add their name and other information in the database. In exit case if any student wants to go before standard exit time or time saved in database then in this case admin of system or class teacher can change the exit time of that particular student so that student get exit permission.

The following are the hardware setup used in developed system:

In a figure 9 hardware unit of the security system is shown which is connected with the PC by serial port and at this system student will tap their card for entry and exit permission by the admin or class teacher.

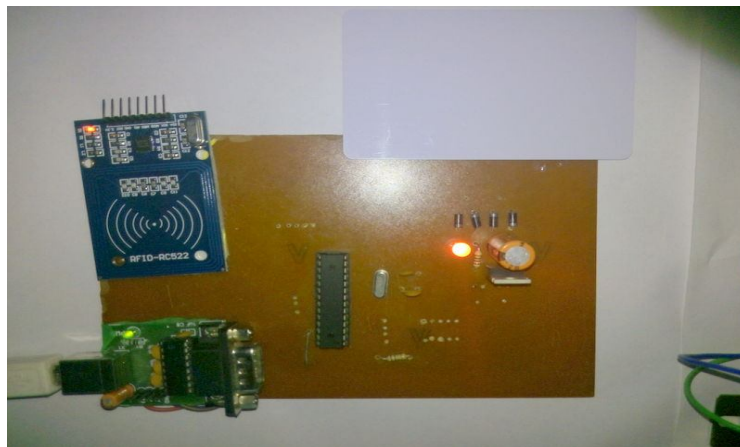


Fig.9 Hardware setup which is connected with PC

In a figure 10 hardware unit of exit system in ON condition is shown. Both hardware unit mainly includes display device LCD, Microcontroller unit ATMEGA 328, RFID reader MFRC522, a power supply IC (7805), led.

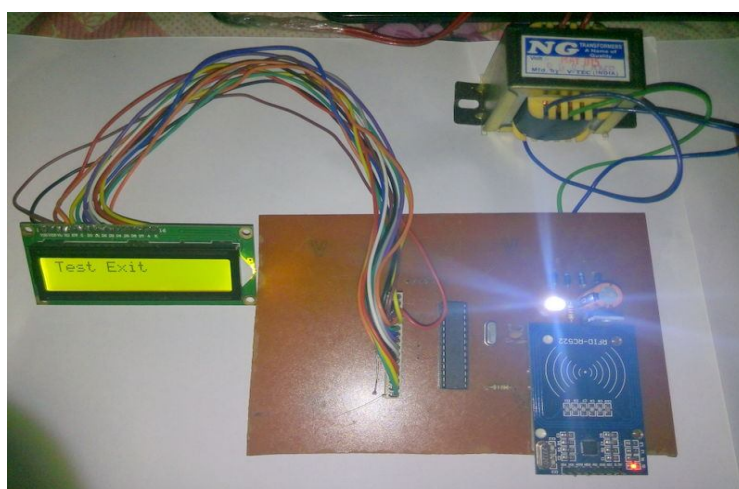


Fig.10 Hardware Setup with LCD at gate keeper side



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## V. CONCLUSION

The created RFID based system giving sufficient goal achievement to trace student entry and exit record with identification and their library record too, in automated way. The system accomplishes the entry and exit control task by the RFID tags. The system includes entrance monitoring system and exit monitoring system with password protected and this whole system is operated with the help of graphic user interface. The successful development of database application for students attendance logging and reporting is finished with the assistance of .net based GUI in a proficient way. Hence this project can be extremely beneficial for colleges and can be implemented in real time applications pertaining to recording the attendance and by this system hard copy paper work of gate pass can be reduced.

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