

# Lab Automation Using Arduino

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**Abstract**— This paper proposes Lab Automation System which will reduce cost of manpower required in computer laboratories of college. This system will reduce the electricity power consumption. This project contains three main modules for implementation of respective goals. First, the attendance module using RFID (Radio-Frequency identification) and Arduino Uno. Second, the switching on the computers on LAN (Local Area Network) using the Wake On Lan command when student enters the lab and switching off the computers automatically as the student leaves. Third, controlling the temperature of the air conditioner using Arduino mega and temperature sensor.

**Keywords**— Arduino, Wake On Lan, Automated AC Control, RFID, Automated attendance.

## I. INTRODUCTION

Today's student wants to learn new things at a great speed at any cost and at a comfortable level. But, it is not feasible to spend unnecessary money and resources where they can be conserved. The implementation of this paper will bring in four major benefits.

1. The extra work of the lab assistants of switching on the computers and switching off the computers before and after the student's use will be reduced.

2. The conservation of electricity.

3. The monetary benefits to the organization as less power are consumed.

4. The reduction of teacher's extra work of conducting attendance and keeping a check on student's absentee and eliminating the chances of faking the attendance.

This system is implemented using the RFID technology, different types of Arduino boards, temperature sensor.

## II. LITERATURE SURVEY

- Smart Home Automation and Security System using Arduino and IOT gives the idea is to enhance the security and automate the houses smartly with the help of Arduino and IOT (Internet Of Things). The task of the project is to resolve the issues of security and daily chores by modern, easy and convenient way by which user's or client's time is not wasted and they can have easy and remote access to their house security and house care. In this system the Arduino is interfaced with different sensors like flex sensor, accelerometer, flame sensor, magnetic sensor, Wi-Fi module, etc. This project presents the idea of home automation and home security using Arduino and IOT. The cloud will receive the data of the home appliances via the wireless module and the mobile of the user and the system should be connected on same wireless network. The sensors will have the control over the things, and the sensors would be in control of user. The flex sensor uses the gesture of fingers to understand and complete a task, the magnetic sensor improves the security of the doors and windows of the houses, etc. The user can see all the data of sensor in user understandable way on a cloud platform like Think speak. . The sensors will be interface with Arduino. The IOT facilitates numerous benefits to the society and from our paper we can provide and prove the strength of IOT that is capable to contribute the services for the purpose of building vast no. of applications and help to implement them on the public platform. This design provides moderate and less expensive way of sensing, monitoring and controlling system in the field of domestic and as well as industrial standard to implement IOT [1].

- Even in this world of modern age, libraries still use the traditional method of maintaining the records of the students and the books. It consumes a lot of time of library staff and students and even there is confusion about the maintenance of records. In order to save up the time and bring the accuracy this system was developed. In this system, Library management is made easy and smartly with the help of RFID (Radio Frequency Identification) technology. The RFID tags are embedded in both, the books and the student's id card or library card. The RFID tags (MI fare 1K) are placed on every book and on the ID cards of the users. Tags consist of a unique code. The RFID reader reads the tags on student id card and displays the information about the transactions made by the student .it will show the detail of whether the student need to return the book or pay the fine. When the student returns the book or pays the fine, reader interacts with the microcontroller Atmega328 and updates the data in the database about the transaction made. If the student needs to issue any book, the reader will read the tag in the books and update the database with the book being issued by the respective student. The student's ID after scanning his/her card is displayed on the LCD. Email is sent to the user regarding the book issued and the date of return. If failed to return within the due date, remainders are given along with the fine amount to be paid to the library [2].
- Wake on LAN (WOL) is hardware and software technology to wakeup sleeping systems by sending specially coded network packets to machines equipped and enabled to respond to the packets. This additional functionality allows administrators to perform maintenance on systems even if the user has powered them down. The Wake on LAN feature allows the administrator to remotely power up all sleeping machines so they can receive updates. Without this feature, administrators would have to personally visit all of the systems to start them up.. a daunting task in a large organization [3].
- An AC (Air Conditioner) which was once considered to be a luxury item and was only to be found in big hotels, movie halls, restaurants etc... But, now almost everyone has a AC in our home to beat out the summer/winter and those who have it, worry about one common thing. That is their high electricity consumption and chargers due to it. In this project it is shown how to make a small Automatic Temperature Control Circuit that could minimize the electricity chargers by varying the AC temperature automatically based on the Rooms temperature. All the Remote Controls in our home that we use to control TV, Home Theatre, AC etc. work with the help of IR Blasters. An IR blaster is nothing but an IR LED which could blaster a signal by repetitive pulsing; this signal will be read by the receiver in the electronics appliance. For each different button on the remote a unique signal will be blasted which after read by the receiver is used to perform a particular pre-defined task. If we are able to read this signal coming out from the Remote, we can then mimic the same signal using an IR LED whenever required to perform that particular task. We have previously made a IR Blaster circuit for Universal IR Remote. A TSOP is an IR Receiver that could be used to decode the signal coming from the Remotes. This Receiver will be interfaced with Arduino to signal for each button and then an IR Led will be used with Arduino to mimic the signal whenever required. This way we can gain control over our AC using Arduino. Now, all that is left is to read the Temperature value using DHT11 and instruct the AC accordingly using the IR signals. To make the project look more attractive and user friendly I have also added an OLED display that display the current Temperature, Humidity and AC set temperature. [4]
- Counting to 315 million students, India has the most number of students in the world. This counts that there is a strong need for the automation when it comes to mark the attendance of these students. 69.133% of the total youth are found college going or taking some kind of education. The traditional system which is being followed since ages is the pen and paper method. Later we observe a time wherein to avoid the intentional fake attendance given by the student's adoption of biometric system was observed. Colleges have started to turn down to this in order to say goodbye to intentional proxy attendances, apart from this when it comes down classroom automation we also need to consider the electric equipment's and their functioning. We have a strong need of a system where it can mark

attendance along with a regular thing (say ID card). Hence these systems will be not only help in attendance but also make things like ID cards compulsory for college premises. A classroom mostly consists of a fan and a tube light at least. Many a times it is observed that it's the human nature and we tend to forget to switch off the lights when we leave the house. This leads to more of energy consumption and wastage of energy. The same scenario can also happen with the classroom. Hence it is considered as one of the most important issue that needs to be addressed. The same system is not only dedicated to solve the problems of class room but the same can also be used in home automation application. The said system can be used to keep a track on the devices that are on in the classroom when we are not present. This will lead to automation plus the energy consumption factor that will save energy. The system will operate with the help of a relay module. The relay controls the circuit functions and acts as an interface between input and output circuits. The system will also require a communication network channel that helps to transmit messages between the application at the user end and the hardware at the system end [5].

### III. PROPOSED SYSYTEM

When there is discussion about the software labs in colleges, there are three main issues addressed in that discussion. They are as follows: Students faking the attendance, more power consumption due to computers are on without anyone using them, Again and again adjusting temperature of AC according to the room's temperature and needs. These three modules as two modules will be integrated using the custom designed software.

#### a) *Automated Attendance and Wake-On-Lan*

The first module is automated attendance registration module and the automated turning on and off of the computer.

In this , the entry and exit time of the student is noted in the database and will be marked as one attendance of the student.

The students need to scan the RFID card to turn of the computer, and also scan it again before they leave the lab.

The RFID signals will send trigger to the software to turn on and turn off the computers.

#### b) *Automated AC*

The second module is air-conditioner's temperature control. This module will take care of the temperature of the lab. The DHT11 sensor connected to Arduino will sense the room temperature. The software will send infrared signal to the Air Conditioner via IR(infrared) blaster to control the temperature as per the thresholds decided for different temperatures.

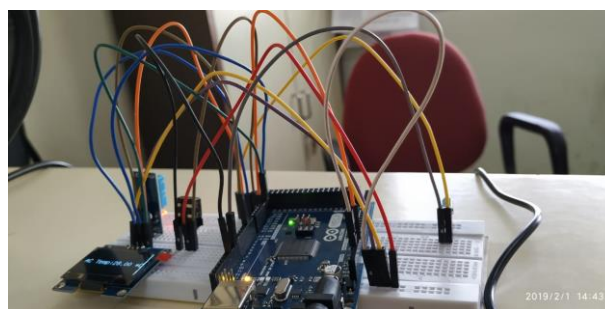


Fig 1. Hardware connection for AC automation Module

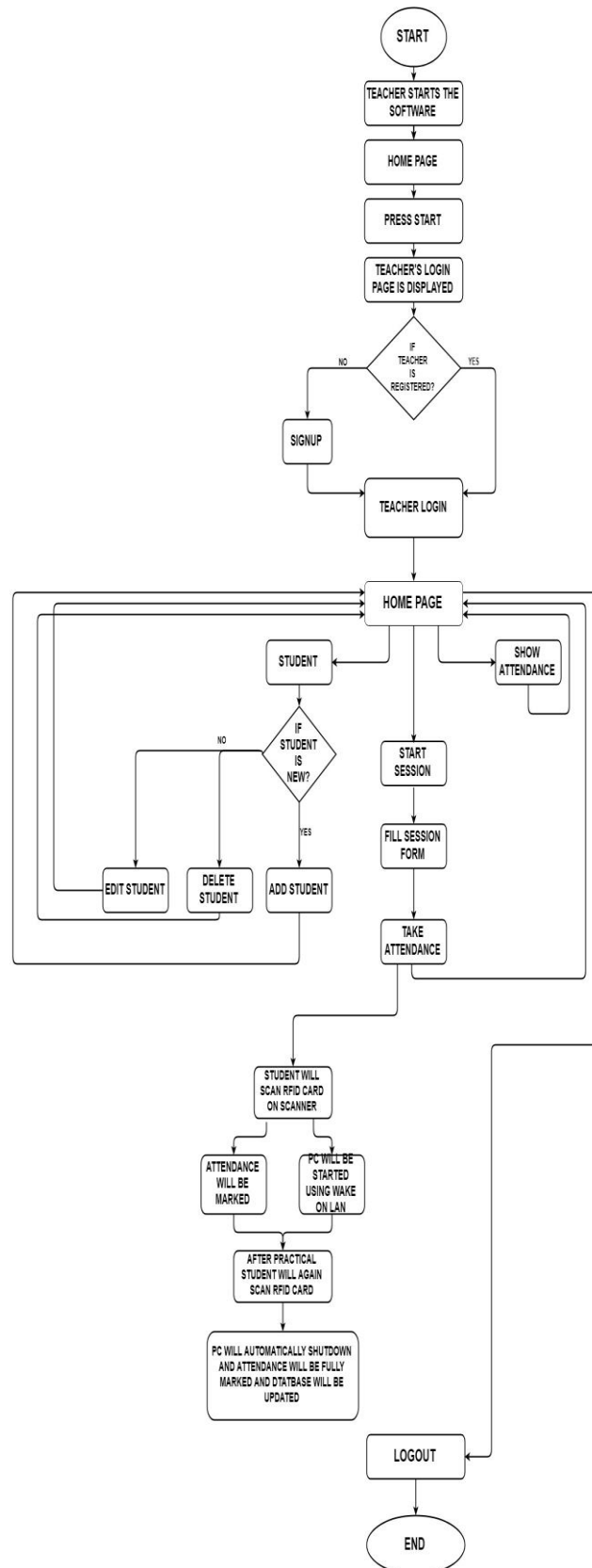


FIG 2. FLOW CHART FOR AUTOMATED ATTENDANCE AND WOL

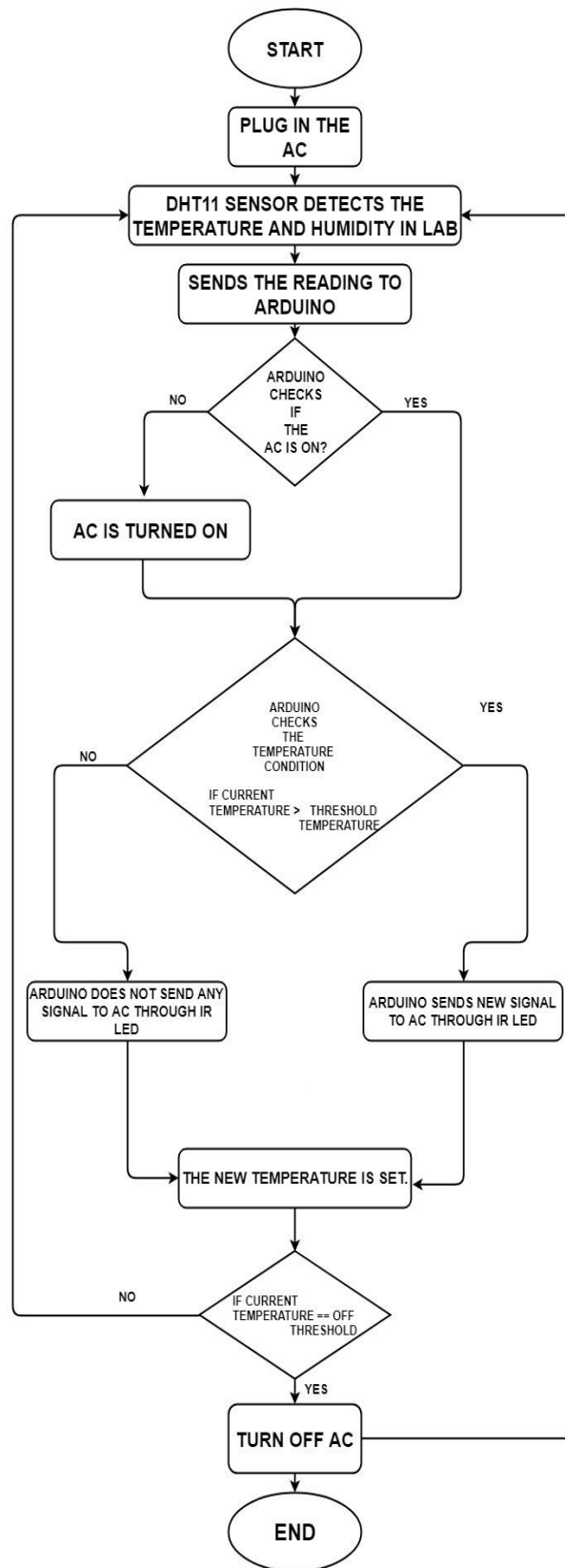


FIG 3. FLOWCHART FOR AUTOMATED AC

- Module II(Attendance and WOL)

### *Students module*

The teacher will start the software.

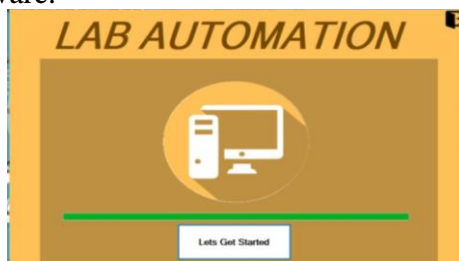


Fig 4. Start Page

The teacher will login into the software using her created id and password.



Fig 5. Teacher's Login page



Fig 6. Teacher's signup page

The id and password will get saved in the database.

The teacher will then login with her credentials into the software. In the background, the id and password will be validated and access will be given if the id and password which the teacher entered are correct or access will be denied.

As the teacher will login the home page will appear.

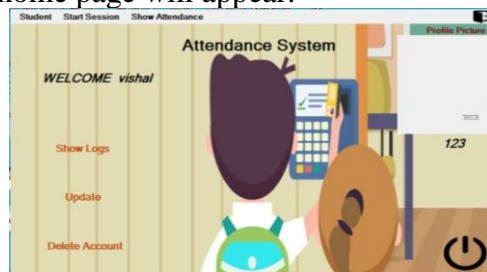


Fig 7. Home page

On the home page teacher will have three options:

Student: In this tab the teacher has three options.

Adding the student in database.

Here, the student's information regarding the students academic details and rfid number, roll number, etc will be stored. The student's information is stored in the database. Editing the student's information in database.

Teacher can edit the student's details herein this tab. And deleting the student from data base.

Fig 8. Student's details

If in case student has to leave the college or department and the record of the student's record has to be deleted from the database the teacher is able to do that under this tab.

Start session

The teacher has two options under this tab:

**Fill session form:**

Fig 9. Session form

Here the teacher will fill the details about the class, batch, subject, topic and date.

**Take attendance:**

Fig 10. Take attendance page

Here the students will scan their RFID card on the RFID reader. The reader will scan the card and send the corresponding information to arduino.

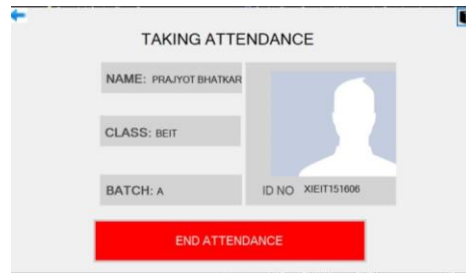


Fig 11. Ongoing attendance

The arduino will send the command to the corresponding computer to turn on and the present attendance of the student will be marked until the student again scans the card to turn off the computer and complete the attendance.

**Show attendance:**

Here, the teacher will be able to see the attendance of the students by just selecting the class, batch of the students.

ID NO	NAME	DATE	TIME
123	vishal	3/13/2019	10:46:37 PM
123	vishal	3/13/2019	10:47:06 PM
123	vishal	3/13/2019	11:30:19 PM
123	vishal	3/13/2019	11:36:02 PM
123	vishal	3/14/2019	11:24:22 AM
123	vishal	3/14/2019	11:26:38 AM
123	vishal	3/14/2019	11:27:37 AM
123	vishal	3/14/2019	11:32:00 AM
123	vishal	3/14/2019	11:32:49 AM
123	vishal	3/14/2019	11:36:13 AM
123	vishal	3/14/2019	12:37:08 PM
123	vishal	3/14/2019	3:54:47 PM

Fig 12. Show attendance of student

#### IV. HARDWARE AND SOFTWARE REQUIREMENTS

**A. Hardware Requirements:**

- 1) RFID cards.
- 2) RFID reader.
- 3) Arduino UNO.
- 4) Arduino MEGA.
- 5) DHT11 Sensor.
- 6) TSOP1728.
- 7) IR LED.
- 8) OLED display.

**B. Software Requirements:**

- 1) Operating System: Windows 7
- 2) Arduino IDE: Version 1.8.7
- 3) SQL SERVER MANAGEMENT TOOLS 2018 LANGUAGE: C#
- 4) MS EXCEL
- 5) VISUAL BASIC 2017



## V. CONCLUSION

The Lab Automation will efficiently aid the students, teachers and lab assistants. This work differs from its predecessors in a way that it helps the staff maintaining attendance of students and defaulter list too. This system gives the ability to maintain AC's temperature according to need. In time, improvements could be made in the system to maintaining temperature. For example, the proposed work leads the AC's maintain room temperature according to humidity sensor not by looking at air temperature. The proposed work leads the automatic turn on and off of computer based on attendance. The proposed work gives the ability to successfully registering attendance using Wake on LAN command.

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