

# Embedded Web Server Based Management and Monitoring for Educational Institute

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**ABSTRACT:** Embedded web server based management and monitoring for educational institute is the system by which we keep records and management of the data of educational institutes. Embedded Web Server is a web server that runs on an embedded system. An Embedded web server which controls and monitors the devices has the advantages over the traditional monitoring system which are based on the PC and chip microprocessor. In various Internet applications based on client server architecture, It is better to use Embedded web server other than PC server because of decreasing volume, cost and less consumption of power. An embedded web server based system by which it is possible to control, manage and monitor any data in the educational institute. The aim of our project is to implement an Embedded Web Server using Raspberry pi module. We are going to create web pages for login and to save educational institute data successfully. We have to create two users, one is normal user and the second one is admin user. Normal user is the user who store educational institute data and admin user is the user who can see that data. The normal user is the faculty member who stored data of his lectures with date, time and topic covered which are taken by him on various classes. The admin user is the Head of the department of the faculty who can observe and watch the daily and weekly report of staff members. When staff member login into the system if he enter the valid data then system have to give message "Login Successful" and if the staff member enters invalid login id or password then system have to give message "Invalid Login". After login the staff member have to store data of their lectures which are held by him on various classes with date, time and topic covered. After the staff member enters his all data about lectures he should be click on submit buttons then system have to give message "Your data has been successfully saved". After the data save by staff members of their lectures admin user (Head of the Department) can see the weekly report of any staff member.

**KEYWORDS:** Embedded Web Server, Raspberry Pi.

## I. INTRODUCTION

The web server concept gives us the flexibility of monitoring and managing the educational institute data. This can also be used as security system and has wide range of applications. Nowadays, monitoring and managing data through pc are very common. In this technology pc it acts as a server. The educational data which are going to monitor and manage are connected to pc. They are bit more cost and cannot work continuously for a long time. The hardware architecture is very complex. The development of this system not only brings more difficulties but also increase maintenance of client software. With the rapid development of technology the embedded systems plays a major role and go through into the areas of people's life. A new technology known as web technology used to monitor and manage the educational institute data through web page. Web-based technology is the more popular technology in the world for sharing or browsing data. Whenever we find internet facility we can monitor and manage the data through web technology.

The system introduces the architecture of the embedded web server for monitoring and managing data using Raspberry Pi and the application of the embedded web server. The faculty members of the institute can save their data to the embedded web server through web pages. After saving the data by faculty members the head of the department of the institute can access that data through web pages which are stored into the embedded web server. The whole

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embedded web server system which is used to keep records and management of the educational institute data is connected through Local Area Network (LAN).

The goal is to develop Embedded Web Server system to keep records and management of the data of educational institute. Head of Department also know the Teacher's daily, weekly performance.

## II. RELATED WORK

In 2009, The embedded database SQLite is widely applied in the data management of embedded environment such as mobile devices, industrial control and information appliance [3]. It is advantages of stability and reliability, fast and high efficiency, portability and so on, this occupies the unique advantages among many of the main embedded databases. It describe the definition, basic characteristics, structure and the key technologies of embedded database, analyses the features, architecture and the main interface functions of SQLite. With the popularity of intelligent appliances, the formation of mobile computing environment, and the rise of mobile commerce, embedded database has become the focus of study currently. SQLite has small core, open source, and database is a file. It is very easy to realize the copy, move and cross platform sharing of database files. It can adapt to the needs of embedded system, it is very convenient to construct an embedded database system.

In 2012, Nurbek Saparkhojayev, Selim Guvercin et.al, proposed laboratory Intelligent monitoring System is based on Zigbee. Sensors controlling board collect the data to web server through Zigbee networks [6]. These sensors automatically monitor the local environmental data and external material intrusion in the laboratory. Zigbee technology provides a direction for scientists who commit to solve the safety environmental monitoring data in laboratories. Managers can control the equipments in the lab through a web browser which is cross platform. The embedded database manages the data collected by sensor networks, realizing the local management of environmental data. The simulation results indicate that design of system is safe and convenient from local management of environmental data in laboratories which is highly availability, reliability and popularization.

Monitoring of students' attendance is one of the important issues for universities. Many universities evaluate students' attendance and while giving the final grade as per their total number of appearances on classes during the whole semester [7]. RFID based attendance control system is flexible, which means that it may be extended by adding more modules. The cards that have been employed for this specific system are RFID cards, and the algorithm used has shown stable and reliable results. These cards can be put to use at the university and may replace student ID cards. RFID technology continues to develop, and the time has come for us to avail ourselves of its promise and convenience. In 2012, the design of Remote Attendance Logging System and its control is a challenging part. RFID reader reads the RFID tag, and the detail of the tag is logged in the embedded system [8]. The Web based distributed measurement and control is slowly replacing parallel architectures due to its non-crate architecture which reduces complexities. A new kind of expandable, distributed large attendance logging system based on ARM Cortex M3 boards has been investigated and developed and uses software platform such as Keil MDK-ARM for firmware and HTML for man machine interface. The data displayed on web pages at different geographical locations, and at the same time can be transmitted to a Remote Data Acquisition System by using HTTP protocol.

K. Bharath Reddy, Ch. Rajendra Prasad proposed, Embedded Web server Electrical Ethernet Monitoring System using ARM. Ethernet is used to remotely monitor power network parameters [9]. A web server in the device provides access to the user interface functions for the device through a device webpage. A web server can be embedded into any appliance and connected to the Internet so the appliance can be monitored and controlled from remote places through the browser in a desktop. The web-server circuit is connected to LAN or Internet. The client or a person on the PC is also connected to same LAN or Internet. The user can also control the devices interfaced to the web server by pressing a button provided in the web page.

Student Information Management System (SIMS) provides a simple interface for maintenance of student information [10]. Student information system deals with all kind of student details, academic related reports, college details, course details, curriculum, batch details, placement details and other resource. It tracks all the details of a

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student from the day one to the end of the course which can be used for all reporting purpose, tracking of attendance, progress in the course, completed semesters, years, coming semester year curriculum details, exam details, project or any other assignment details, final exam result and all these will be available through a secure, online interface embedded in the college's website. It reduces the man power required. It provides accurate information always. This system is essential in the colleges/hostels and universities. The humble effort is to produce a prototype for a device which helps in keeping an exact record of student attendance using our device. The major problem faced by organizations is time consumption in taking attendance. This project totally eliminates the paper work in maintaining the attendance of each student in schools, colleges or universities [11]. The goal is to have electronic files containing details about each student and their attendance status. Try to organize the current attendance record system that will be much quicker and save time of instructors.

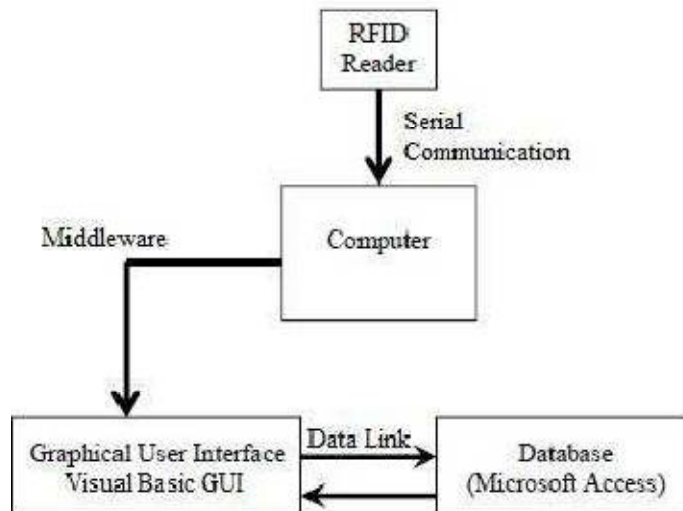


Figure 1: Block representation of RFID system

The developed Web-Based Student Attendance System using Radio Frequency Identification technology will significantly improve the current manual process of student attendance recording and tracking system [12]. The conventional method of taking attendance by calling names or signing on paper is very time consuming and insecure, hence inefficient. The system has been built using the web-based applications such as ASP.NET and IIS server to cater the recording and reporting of the students' attendances. The system can be easily accessed by the lecturers via the web and most importantly. The reports can be generated in real-time processing and providing valuable information about the students to parent.

In 2013, Pallavi Verma, Namit Gupta, et.al proposed, the fingerprint based student attendance system using GSM [13]. The system includes terminal fingerprint acquisition module and attendance module. The system sends the attendance of every student to their parent's mobile through GSM. The main aim of system is to monitor the student attendance in lecture, tutorial and laboratory sessions in more efficient way and send this attendance to their parents. This system resists students from bunking classes through SMS sending feature to parents. Biometrics has been used effectively for more than a decade for time and attendance system. Fingerprint attendance system is a cost effective simplified system that uses fingerprints for identification. Student is regularly absent within four day or six days free voice call to call the parents mobile number by using GSM technology. The design of embedded web server based on ARM 9 Micro-processor and Linux platform and analyses hardware configuration and software implementation for monitoring and controlling systems. It mainly targets on crucial points of promoting the GUI applications which are based on Embedded and the Linux drivers for different types of sensors in monitoring and controlling system projects. The system for monitoring and controlling devices based on embedded web server replaces the pc web server. The user

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can monitor and control the devices through web technology. The system has low cost, portability and is easy to upgrade and maintain. This system can be applicable in educational institutes, industries etc [14].

In 2014, the cloud-based course management system for higher educational institutions is proposed. Through cloud services the student’s assignments, examinations and other activities are automatically recorded in a database and immediately the results are evaluated [15]. It provides online examination that can randomize questions from the question bank which provides unique set of questions per student. The synchronization in automated examination is secured even though there is limited space for the examinees and they are seated closely with each other as they take the exam. It can be utilized as an alternative strategy for delivering courses to facilitate resources and services in the classroom. Data Acquisition system deals with the monitoring and acquisition of physical parameters in the real time necessary in Industrial Automation [16]. The embedded device communicates through General Packet Radio Service (GPRS), which makes it accessible from anywhere in the world through a web server built into the embedded device. A novel approach is introduced to minimize the operational costs while operating with a large amount of data. The system is demonstrated to work for online as well as offline. A novel approach introduced minimizes the operational costs while operating with a large amount of data. The system is demonstrated to work for online as well as offline. This system has advantages in terms of allowing direct communication and reducing overhead, which can be vitally important for some real-time applications.

The embedded web server technology is the combination of embedded device and Internet technology [17]. The new technologies and algorithms for monitoring such as Internet, web server and embedded system can be integrated, then a more comprehensive, efficient and effective data acquisition can be realized. It is the server that can be configured by the user in order to monitor various physiological parameters of the patients. The development uses the microcontroller from Philips and the Ethernet controller from Microchip. The system is based on the embedded technology of ARM processor in the development and research of data collection. Embedded Web Server based on ARM11 processor and Linux operating system using Raspberry Pi [18]. It will provide a powerful networking solution with wide range of application areas over internet. The web server is based on an embedded system having limited resources to serve embedded web page to a web browser. The task of project is to implement an embedded web server based on ARM11 and Linux which can be accessed by any client over internet. By using embedded processors such as Advanced RISC Machine (ARM) and Linux as the operating system embedded web server can build with low cost, low power consumption, high performance, high reliability and support from large developing community.

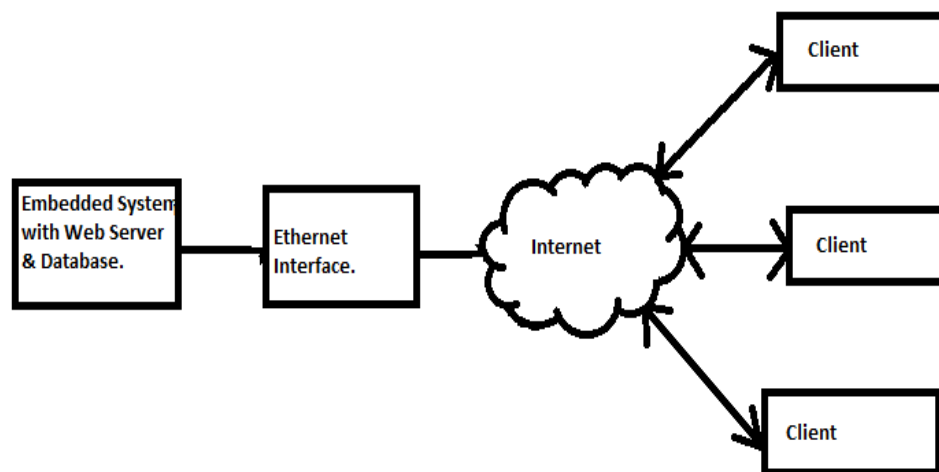


Figure: 2 Architecture of Embedded Web Server

Karthik K. Murthi, Y. B. Dhanalakshmi proposed, advanced collage surveillance system. GSM based tracking system will pass complete information about the student and their activities [19]. The RFID system is utilized as a

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board module to attach the parts of the object say student and follow the object then and there. A novel fingerprint reconstruction algorithm is used to automate the whole process of taking attendance for staff and lecturers, manually which is a laborious and troublesome work and waste a lot of time, with its managing and maintaining the records for a period of time is also a burdensome task. The designed model is studied under laboratory scale and the results are analyzed. College Management Software is a simple powerful one joint integrated platform that connects all the various departments of an institution like Administration, Account, Student section, Student and many more specialized modules [20]. The process of notice boards, important notification about academics has been carried out manually almost across all educational institutions. The development of system is based on the concept of web services which is implemented on Android mobile application as well as on PC that communicates with the database residing on a remote server. The Unique ID system provides unique identification numbers to the persons who using this system. UID Number which would not just help the admin to track down individuals. College management system is helpful for Reduction in manual work so less manpower required.

In 2015, ARM is world's most powerful technology using advanced RISC machine and in build web server application with General Packet Radio Service technology [21]. Users can monitor different remote systems by using embedded web server. GPRS technology along with GSM makes it accessible from anywhere in the world. Various sensors installed at working place help in real time monitoring like temperature, humidity, carbon monoxide, Speed, LPG gas leakage etc. This proposed work is an attempt to design a data acquisition system allows information to be collected with no labor requirements, cost efficient and easy to maintain technology. The system Online Intranet College Management System (CMS) is an Intranet based application that can be accessed throughout the institution or a specified department [22]. It is used for monitoring attendance for the college. Students as well as staffs logging in may also access or can be search any of the information regarding college. Attendance of the staff and students as well as marks of the students will be updated by staff. CMS is an intranet based application that aims at providing information to all the levels of management within an institution.

The main core of the system is an embedded hardware running a scaled-down version of Linux, a popular choice of operating system for embedded applications [23]. On-line embedded web server is a challenging part of many embedded and real time data acquisition and control system applications. The World Wide Web is a global system of interconnected computer networks that use the standard Internet Protocol Suite (TCP/IP) to serve billion of users worldwide and allows the user to interface many real time embedded applications like data acquisition. The approached towards the design and development of on-line Interactive Data Acquisition and Control System using ARM based embedded web server.

Raspberry pi is smart, economic and efficient platform for implementation of industrial automation device. Implementation of web server using Raspberry Pi for intelligent monitoring is new method to monitor parameter. The whole system has low-cost and easy to maintain and upgrade. Real time data monitoring and controlling of device from distance location that is possible using Raspberry Pi and web server. Embedded web server technology is the combination of embedded device and Internet technology. Using embedded web server flexible remote device monitoring and controlling and management function based on internet browser. Using both technology reduce complexibility of devices, reduce overall cost [24]. Student Attendance Monitoring System, whose design process allowed us to explore some of the challenges faced when designing a secure embedded systems [25]. It was implemented a S.A.M.S. prototype using an Arduino UNO and several inexpensive peripherals. The main function of the system is to register classroom attendance (student ID) while storing the data securely. The student enters his ID using a keypad, then S.A.M.S. stores the ID plus a timestamp encrypted using the RC5 encryption algorithm. Later, the professor can access the encrypted attendance list through a web server hosted by the embedded system.

### III. PROBLEM STATEMENT

Existing system are based on web based on the web monitoring of student in institute, embedded web based server of monitoring and controlling of system or devices and embedded web server based data acquisition system. The existing systems have small area of application. As per review of existing system have small area of application. The present system is specially proposed for educational institute. In proposed system embedded web server based management and

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monitoring of lectures taken by lecturer is done. The system is to manage and monitor the educational institute which is based on ARM 11 microcontroller.

### IV. PROPOSED SYSTEM

The system is fully embedded based monitoring and management system for educational institute. The system consists of ARM 11 microcontroller (Raspberry Pi Board), keyboard and mouse and LCD output display. This system is totally based on the web server and database. The system is having two web pages for normal and admin user. Normal user is lecturer and admin user is head of department or head of institution. The all information is saved in to the raspberry pi module. The lecturer is login on first web page using login ID and password on front page. After successful login second web page will be open. Then lecturer feels the all information about lecture taken by lecturer. The information is in the form of date, time, class, lecture, topic covered. The information is submitted. The admin user may check report of data entered by lecturer daily or weekly. The system is more beneficial for data management for institution. The ARM 11 is the heart of the whole system. The block diagram of proposed system is given below.

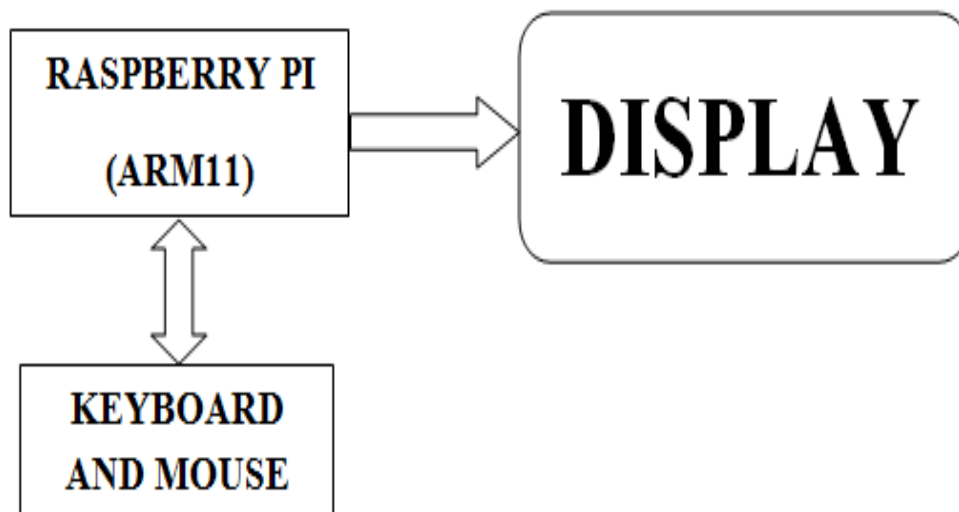


Figure 3: Overall Architecture of Proposed System

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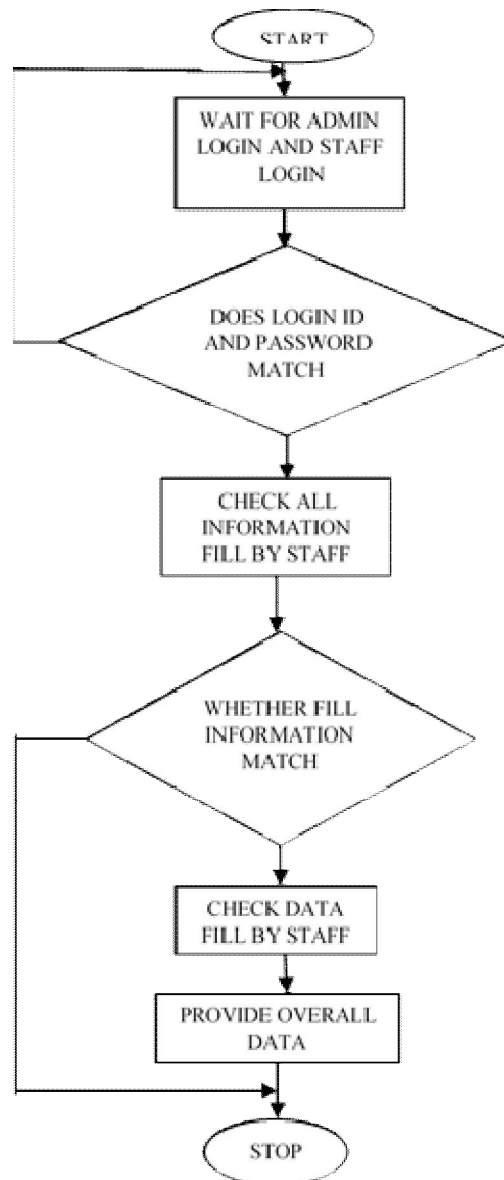
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## V. ALGORITHM AND FLOWCHART

### FLOWCHART ALGORITHM



1. Start.
2. Wait for admin and staff login.
3. MySQL is leading open source database management system. MySQL database is stored in raspberry pi module. We have stored the database of faculty about staff name, class, lecture, lecture type, topic covered. The information of any staff member is fetch from staff database as per respective data comes and information about faculty of respective staff member is given to admin. MySQL database is more useful to stored information as compared to the array. MySQL is multiuser, multithread database management system.

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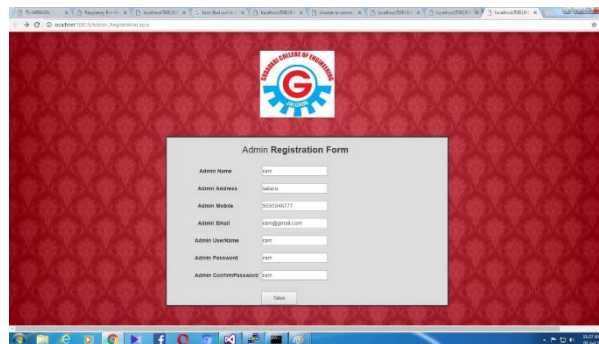
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4. As admin login from registered login id and password, stored data of faculty members are verified.
5. If login id and password matches with stored login id and password then data will be responded automatically.
6. If the login id and password doesn't matched with the stored database, the login will be automatically rejected.
7. Same process will be repeated for all the all the login of admin and staff members.
8. End.

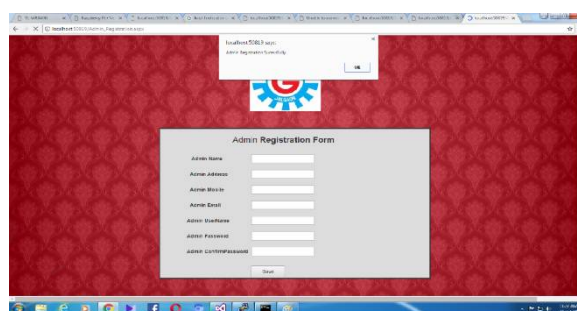
## VI. EXPERIMENTAL RESULTS



The screenshot shows a web browser window displaying the 'Admin Registration Form'. The form is centered on a red background with a repeating pattern. At the top center of the page is a logo for 'INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY' featuring a gear and a globe. The form itself is a light gray box with the following fields: Admin Name, Admin Address, Admin Mobile, Admin Email, Admin Username, Admin Password, and Admin Confirm Password. Each field has a corresponding input box. A 'Save' button is located at the bottom right of the form.

Figure 4: Admin Registration Form

Figure 4 shows the Admin Registration form by which admin can login into the system. After filling all the correct information admin gets successful login into the system. Once admin login then after he can see all the information fill by the staff members. For Admin login the required fields are Admin Name, Address, Mobile number, Email Id and Password. By filling all the correct information Admin can login into the system.



The screenshot shows the same 'Admin Registration Form' as in Figure 4, but with a small dialog box overlaid on top. The dialog box has a title bar that says 'Feedback/5083.html' and contains the text 'Admin Registration Form (10/10)'. The form fields are still visible and appear to be filled with text, indicating that the registration process has been completed successfully.

Figure 5: Successful Registration Of Admin

Figure 5 shows successful registration of admin. After filling all the correct information admin get to login successfully into the system.

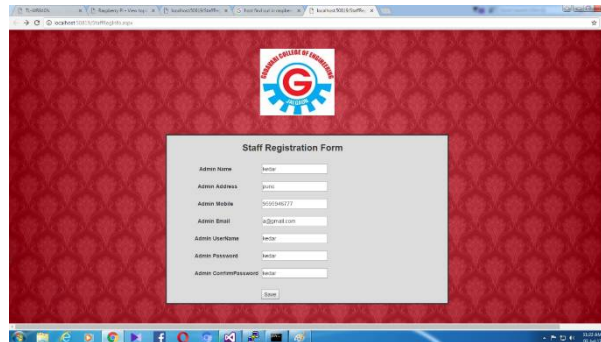


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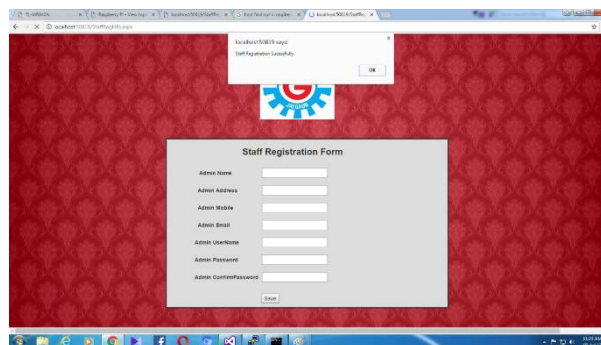


The screenshot shows a web browser window displaying the 'Staff Registration Form'. The form is centered on a red background with a repeating pattern. At the top center of the page is the IJRSET logo. The form fields include: Admin Name, Admin Address, Admin Mobile, Admin Email, Admin Username, Admin Password, and Admin Confirm Password. A 'Save' button is located at the bottom of the form.

Figure 6: Staff Registration Form

Figure 6 shows the Staff Registration form by which Staff can login into the system. After filling all the correct information Staff gets successful login into the system. Once Staff login then after he can see all the information fill by the staff members. For Staff login the required fields are Staff Name, Address, Mobile number, Email Id and Password. By filling all the correct information Staff can login into the system.

Figure 7: Successful Registration Of Staff



The screenshot shows the same 'Staff Registration Form' as in Figure 6. A small white dialog box with a blue border is overlaid on top of the form, displaying the text 'Successful Staff Registration' and a 'OK' button. The form fields and 'Save' button are still visible behind the dialog box.

Figure 7 shows successful registration of Staff. After filling all the correct information Staff get to login successfully into the system.



The screenshot shows a web browser window displaying the 'Staff Faculty Form'. The form is centered on a red background with a repeating pattern. At the top center of the page is the IJRSET logo. The form fields include: Staff Name, Class, Lecture Type, Lecture, and Topic Covered. A 'Save' button is located at the bottom of the form.

Figure 8: Staff Faculty Form

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Figure 8 shows Staff faculty form. In this form staff members can fill all the details of their lectures taken by them. This form covers the information like Staff name, Class, Lecture type and Topic covered.



Figure 9: Admin View Faculty Details

Figure 9 shows Admin view faculty detail. By login into this window Admin Can see all the details which is filled by staff members and faculty members.



Figure 10: Faculty Information On Display

Figure 10 Shows faculty information on display. This figure shows all the information which is filled by staff members on display. This information can be seen by admin by login into the system.

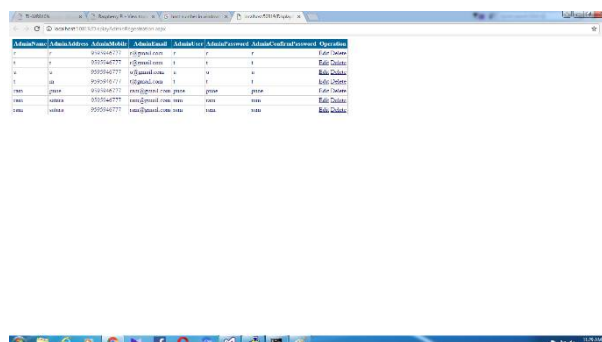


Figure 11: Admin Registration On Display

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Figure 11 Shows Admin Registration on display. This figure shows all the registration which is done by Admin on display.

## VII.CONCLUSION

Management and monitoring of educational institute have been reviewed, every system has its own importance. Now we have proposed such system which is very useful for keeping records of educational institute as well as monitoring the educational institute. This project, implemented using the Raspberry Pi and GSM module. By using this system all the educational institute record have been save safely which is useful for staff members also for the admin. By using the Raspberry Pi, there is scope to saving important data of all institutes of their faculties which is more users friendly and wide application areas.

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