A PROJECT REPORT

ON

IOT BASED SMART LEARNING SYSTEM

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IN THE PARTIAL FULFILLMENT OF THE REQUIREMENTS

FOR THE AWARD OF THE DEGREE

BACHELOR OF ENGINEERING (COMPUTER ENGINEERING)

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SAVITRIBAI PHULE PUNE UNIVERSITY

2023-2024

CERTIFICATE

This is to certify that the following students have satisfactorily carried out their final semester B.E. Project work entitled **"IOT BASED SMART LEARNING SYSTEM"** under the guidance of **Dr. Alpana Adsul**. This work is being submitted for the award of Bachelor of Computer Engineering. It is submitted in the partial fulfillment of the prescribed curriculum of Savitribai Phule Pune University, Pune for the academic year **2023 – 2024**.

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Goal makes us to do work. Vision is more important than goal which makes us to do work in the best way to make work equally the best. Thanks to Principal, Dr.Suresh Mali for his support and vision

Consistent achievement requires boost on consistent interval basis. Management has given full support and boosted us to be consistent and achieve the target. Thanks to management for their support.

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ABSTRACT

The project discusses the design and development of an Android application which provides career guidance to the students. The application can be used by students and parents as it provides complete details of colleges like tuition and accommodation fees, eligibility criteria, campus placement opportunities, accommodation facilities, scholarship schemes, campus support services, rules and regulations etc. It helps students to select colleges in engineering and management field in India and abroad based on the factors like qualifying exam details, technical expertise and other details. The application prepares the college list as per the entrance examination marks and the eligibility criteria of colleges and the courses chosen. The college list is filtered based on parameters like institution ranking, fee limits and location chosen. The registration to selected college involves student extensive details and Aptitude Test (AT). The Aptitude Test is multiple choice question (MCQ) based and includes verbal section, quantitative section and general knowledge. The application will help the students to get the most appropriate college and the course in the field of their interest in India or abroad.

Keywords: Android application; Android platform ; College and Course Finder; Graphical User Interface (GUI).

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Chapter 1

INTRODUCTION TO THE PROJECT

A learning app is a software application designed to facilitate and enhance the process of learning, whether it's for educational purposes, personal development, skill acquisition, or any other form of knowledge acquisition. Learning apps have become increasingly popular due to the widespread use of smartphones and the need for convenient and accessible ways to acquire knowledge.

1.1 MOTIVATION:

Learning apps often incorporate gamification elements, such as points, badges, levels, and leaderboards. These game-like features can make the learning process more engaging and enjoyable, motivating users to progress and achieve higher scores or ranks.purely for the joy it brings is intrinsically motivated. Learning apps that tailor content to individual users' needs and learning styles can enhance motivation. Personalized recommendations, adaptive difficulty levels, and content that aligns with a user's interests can keep them engaged. [2]

1.2 PROBLEM DEFINITION:

Determine the specific group of learners for whom the app is intended. This could be students, professionals, language learners, or any other demographic. Understand their needs and preferences. Define the educational goals and objectives of the app. What knowledge or skills do you want the users to acquire or improve? Specify the learning outcomes you aim to achieve.[2]

1.3 THE AIM OF THIS PROJECT :

Educational Empowerment: The primary aim of the learning app may be to empower users with knowledge and skills that can enhance their personal or professional lives. Access to Quality Education: To provide accessible, high-quality education to a wide range of users, regardless of their location, background, or other limitations. Engagement and Motivation: Aiming to create an engaging and motivating learning experience that keeps users interested and motivated to continue learning.[2]

1.4 PROJECT OBJECTIVES:

Content Objectives: Define what the app aims to teach or cover in terms of subjects, topics, and skills. For example, if it's a language learning app, an objective could be to teach users to speak, read, and write in a particular language. User Engagement Objectives: Specify how the app will engage users, whether through gamification, interactive content, or other methods, with the goal of maintaining their interest and motivation.[**?**]

1.5 PROPOSED SYSTEM:

Interactivity: Explain how users will interact with the app, including features like quizzes, exercises, and discussions. Personalization: Describe how the app will provide personalized learning exp Gamification: Outline gamification elements used to motivate and engage users, such as points, badges, and leaderboards[**?**]

1.6 LITERATURE SURVEY

Several studies have been conducted on live temperature and humidity monitoring systems with gas detector capabilities, indicating the growing interest in this field. The following is a brief literature survey on this topic.

1. **"Real-time environmental monitoring using wireless sensor networks: A systematic review" by Reaz Ahmed et al. (2019)**.

This study provides a comprehensive review of the literature on wireless sensor networks for real-time environmental monitoring. The authors reviewed 262 articles and identified several key applications, including temperature and humidity monitoring, air quality monitoring, and water quality monitoring. The study highlights the importance of real-time data for optimizing processes and improving efficiency.

"Real-time environmental monitoring using wireless sensor networks: A systematic review" is a research article published in the International Journal of Distributed Sensor Networks in 2019. The article provides a comprehensive review of the literature on wireless sensor networks (WSNs) for real-time environmental monitoring.

The authors identified 262 articles related to real-time environmental monitoring using WSNs, and conducted a systematic review of these articles to identify the key applications, challenges, and future directions in this field. The review covered a wide range of applications, including temperature and humidity monitoring, air quality monitoring, water quality monitoring, and noise monitoring.

The article highlights the importance of real-time data for optimizing processes and improving efficiency in various industries. Real-time monitoring can provide early warning of potential hazards, allowing personnel to take appropriate actions to prevent accidents or equipment damage.

The authors conclude that WSNs have great potential for real-time environmental monitoring, and that further research is needed to address the challenges and improve the reliability and accuracy of sensor data.

2. ”Design and development of a real-time air quality monitoring system using wireless sensor network technology” by Nandhini et al. (2018)

This study describes the design and development of a real-time air quality monitoring system using wireless sensor network technology. The system was designed to monitor various air pollutants, including carbon monoxide, nitrogen dioxide, and sulfur dioxide. The study highlights the importance of gas detection in ensuring the safety of personnel in various industries.

”Design and development of a real-time air quality monitoring system using wireless sensor network technology” is a research article published in the International Journal of Engineering & Technology in 2018. The article describes the design and development of a real-time air quality monitoring system using wireless sensor network (WSN) technology.

The system was designed to monitor various air pollutants, including carbon monoxide (CO), nitrogen dioxide (NO2), and sulfur dioxide (SO2), which can have harmful effects on human health and the environment. The authors developed a prototype system that consisted of sensor nodes, a gateway node, and a web-based user interface.

The sensor nodes were equipped with gas sensors to measure the concentration of air pollutants, as well as temperature and humidity sensors to monitor environmental conditions. The gateway node was responsible for collecting data from the sensor nodes and transmitting it to the web-based user interface, where users could monitor the air quality in real-time.

3. ”Wireless Sensor Network-based Temperature and Humidity Monitoring System for Livestock Farms” by Xiaoling Huang et al. (2021)

This study describes the design and implementation of a wireless sensor network-based temperature and humidity monitoring system for livestock farms. The system was designed to monitor the temperature and humidity levels in livestock farms, providing real-time data that can be used to optimize animal health and improve productivity. The study highlights the importance of temperature and humidity monitoring in agriculture and livestock farming.

”Wireless Sensor Network-based Temperature and Humidity Monitoring System for Livestock Farms” is a research article published in the Sensors journal in 2021. The article describes the design and implementation of a wireless sensor network (WSN)- based system for temperature and humidity monitoring in livestock farms.

The authors developed a prototype system that consisted of sensor nodes, a coordinator node, and a web-based user interface. The sensor nodes were equipped with temperature and humidity sensors to monitor the environmental conditions in the livestock farms. The coordinator node was responsible for collecting data from the sensor nodes and transmitting it to the web-based user interface, where users could monitor the temperature and humidity in real-time.

The authors conducted experiments to evaluate the performance of the system and found that it provided accurate and reliable real-time data on temperature and humidity.

4. ”Gas Detection System for Coal Mine Safety Based on Wireless Sensor Network” by Mengqiao Wang et al. (2019)

This study describes the design and development of a gas detection system for coal mine safety based on wireless sensor network technology. The system was designed to monitor various hazardous gases, including carbon monoxide, methane, and oxygen. The study highlights the importance of gas detection in ensuring the safety of personnel in the mining industry.

”Gas Detection System for Coal Mine Safety Based on Wireless Sensor Network” is a research article published in the Journal of Sensors in 2019. The article describes the design and implementation of a wireless sensor network (WSN)-based gas detection system for coal mine safety.

The authors developed a prototype system that consisted of sensor nodes, a gateway node, and a web-based user interface. The sensor nodes were equipped with gas sensors to measure the concentration of hazardous gases, including carbon monoxide, methane, and oxygen. The gateway node was responsible for collecting data from the sensor nodes and transmitting it to the web-based user interface, where users could monitor the gas concentrations in real-time.

The authors conducted experiments to evaluate the performance of the system and found that it provided accurate and reliable real-time data on gas concentrations. The system was also found to be energy-efficient, with the sensor nodes consuming minimal power.

The article highlights the importance of gas detection in ensuring the safety of personnel in the mining industry, as exposure to high concentrations of hazardous gases can be life-threatening. The authors suggest that the system could be further improved by adding more sensor nodes to cover a larger area, and by integrating machine learning algorithms to predict gas concentrations based on historical data.

Overall, this article provides valuable insights into the design and implementation of a WSN-based gas detection system for coal mine safety, and highlights the potential benefits of these systems for improving workplace safety .

5. ”Wireless sensor network-based monitoring system for indoor temperature and humidity” by A. L. A. Gunathilaka et al. (2018)

”Wireless sensor network-based monitoring system for indoor temperature and humidity” is a research article published in the Journal of Advances in Science and Engineering in 2018. The article describes the design and implementation of a wireless sensor network (WSN)-based monitoring system for indoor temperature and humidity.

The authors developed a prototype system that consisted of sensor nodes, a gateway node, and a web-based user interface. The sensor nodes were equipped with temperature and humidity sensors to measure the environmental conditions, and were deployed throughout a building to provide comprehensive coverage. The gateway node was responsible for collecting data from the sensor nodes and transmitting it to the web- based user interface, where users could monitor the temperature and humidity in real- time.

The authors conducted experiments to evaluate the performance of the system and found that provided accurate and reliable real-time data on temperature and humidity.

The system was also found to be energy-efficient, with the sensor nodes consuming minimal power. The article highlights the potential applications of the system for building automation, HVAC control, and energy management.

6. ”Design of wireless sensor network for temperature and humidity monitoring in greenhouse” by Yanqin Zhu et al. (2018)

The authors developed a WSN-based monitoring system that consisted of multiple sensor nodes, a gateway node, and a computer-based user interface. The sensor nodes were equipped with temperature and humidity sensors, and were deployed throughout the greenhouse to collect data on environmental conditions. The gateway node was responsible for collecting data from the sensor nodes and transmitting it to the computer-based user interface, where users could monitor the temperature and humidity in real-time.

The authors evaluated the performance of the system by conducting experiments in a real-world greenhouse environment. The results of the experiments showed that the system was able to provide accurate and reliable real-time data on temperature and humidity. The authors also demonstrated that the system was energy-efficient, with the sensor nodes consuming minimal power.

The article highlights the potential applications of the system for greenhouse management and optimization. By monitoring temperature and humidity levels in real- time, greenhouse managers can optimize the use of heating, ventilation, and irrigation systems, and improve crop yields and quality. The system can also be used to detect and prevent issues such as mold growth and pest infestations, which can have a significant impact on crop health and yield.

Chapter 2

RESEARCH PAPERS

2.1 PAPER I:-

Intelligent Campus and English Visual Education System Design Based on Internet of Things:

With the continuous development of the level of technology and the Internet, the era of big data has arrived. At present, in the context of the big data era, the traditional education model has been greatly impacted. To be specific, the new foreign language education, characterised by digital edu- cation, is undergoing a huge change in information technology .

Also, English language education incorporates social, cultural, and informa- tional aspects and is being transformed by a new model of online interactive foreign language teaching [3–5]. At the same time, information technology has been used in almost all aspects of people's daily lives, and this development of information networks has led to the emergence of the Internet of Things (IoT) technology . The concept of the Internet of Things is a network concept that stretches from its customer side to the exchange of in- formation and communication between any two objects. This technology allows real objects to be connected to the Internet by means of information sensing devices such as radio frequency identification.

positioning systems [14–16], and laser scanners [17, 18], fol- lowing set rules. By assisting in this way, objects and the Internet can communicate effectively and thus be transformed intelli- gently. By obtaining information between intercon- nected ob- jects, the IoT's RFID technology enables more specific, detailed.

2.2 PAPER II:-

Design of Smart Classroom System Based on Internet of Things Technology and Smart Classroom:

The continuous development of new media technology promotes the development of modern education technology and at the same time puts forward higher requirements for modern education technology workers. The continuous updating of educational technology, coupled with the im- provement of the functionality and operability of multi- media classrooms, has created favorable conditions for the application of modern educational technology in colleges and universities.

The use of multimedia equipment to de- velop and serve modern teaching has become a common phenomenon and then developed into a new teaching mode. Based on the concepts of smart equipment management, safety management, and energy-saving management in the classroom, this paper designs and develops an IoT cloud platform for smart classrooms and realizes real-time man- agement of classroom environment information, combined with the development of smart campus. With the development of information technology and the wave of intelligent technology, colleges and universities are exploring new teaching models to meet the needs and development of education. Through thinking and improving teaching, students' subjective initiatives can be mobilized and their creativity cultivated. The Internet of Things technology is developing rapidly. The use of Internet of

Students majoring in the Internet of Things, computer, and other related majors can use the platform to learn wireless sensing technology and embedded development technology and can also use the provided interface to carry out the secondary development of the project.

2.3 PAPER III:-

Application of Internet of Things Technology in Mobile Education of Smart Campus Culture and Etiquette:

As the lower concept of management, school management is also facing unprecedented opportunities and challenges under the influence of modern advanced science and tech- nology [1]. We can all realize that the economic manage- ment, government management, enterprise management, and other related management existing in the society have been at the forefront of advanced science and technology, and today's world is in a period of great development, change, and adjustment.

If school management can keep up with the trend of science and technology, it will bring great harvest [2]. Therefore, with the progress and develop- ment of mobile Internet technology, the society has entered a new mobile Internet era. The home school communication mode of traditional school management will eventually be replaced by the information communication mode. In order to enable school managers and teachers to use mobile phones and other mobile Internet to communicate with par- ents in real time and to enable parents to use mobile phones and other mobile Internet to grasp students.

learning situa- tion and communicate effectively with teachers in time, the school has introduced a smart campus management system for the management of the school, which to a certain extent enhances the scientific, democratic, efficient, and standard- ized school management, meets the needs of schools, teachers, parents, and students in school management, and greatly promotes the reform of school management. How- ever, there are many different problems in the practical application of schools, teachers, and parents, which affect the mobile process of school management.

Chapter 3

SOFTWARE REQUIREMENT SPECIFICATION

3.1 ASSUMPTION AND DEPENDENCIES

- User must require the java.
- User has to install the android on his pc.
- User has to login to the system.
- User has to their account details feels secure.

3.2 SYSTEM FEATURE

- To have understanding of the problem statement.
- To know what are the hardware and software requirements of proposed system.
- To have understanding of proposed system.
- To do planning various activates with the help of planner.
- Designing, programming, testing etc.

3.3 USER INTERFACE

- Friendly application to interact with user.

3.4 HARDWARE INTERFACES

RAM : 8 GB

As we are using Machine Learning Algorithm and Various High Level Libraries Laptop

RAM minimum required is 8 GB. Hard Disk : 500 GB Data Set of CT Scan images is to be used hence minimum 40 GB Hard Disk memory is required. Processor : Intel i5 Processor

3.5 SOFTWARE INTERFACES

Android Visual studio: Android Studio is the official integrated development environment for Google's Android operating system, built on JetBrains' IntelliJ IDEA software and designed specifically for Android development. It is available for download on Windows, macOS and Linux based operating systems.Android Studio provides a unified environment where you can build apps for Android phones,tablets, Android Wear, Android TV, and Android Auto. Structured code modules allow you to divide your project into units of functionality that you can independently build, test, and debug

Kotlin is a cross-platform, statically typed, general-purpose programming language with type inference. Kotlin is designed to interoperate fully with Java, and the JVM version of Kotlin's standard library depends on the Java Class Library, but type inference allows its syntax to be more concise. Kotlin is a modern statically typed programming language used by over 60 of professional Android developers that helps boost productivity, developer satisfaction, and code safety.

Database: The Firebase Realtime Database is a cloud-hosted database in which data is stored as JSON. The data is synchronized in real-time to every connected client. All of our clients share one Realtime Database instances and automatically receive updates with the newest data, when we build crossplatform applications with our iOS, and JavaScript SDKs.The Firebase Realtime Database is a NoSQL database from which we can store and sync the data between our users in

real-time. It is a big JSON object which the developers can manage in real-time. By using a single API, the Firebase database provides the application with the current value of the data and updates to that data. Real-time syncing makes it easy for our users to access their data from any device, be it web or mobile. The Realtime database helps our users collaborate with one anothe.

3.6 PERFORMANCE REQUIREMENTS

The performance of the functions and every module must be well. The overall performance of the software will enable the users to work efficiently. Performance of detect face should be fast. Performance of the providing virtual environment should be fast.

3.7 SAFETY REQUIREMENTS

The application is designed in modules where errors can be detected. This makes it easier to install and update new functionality if required.

3.8 SOFTWARE QUALITY ATTRIBUTES

1. **Adaptability**: This software is adaptable by all users.
2. **Availability**:This software is fre ely available to all users. The availability of the software is easy for everyone.
3. **Reliability**: After the deployment of the project if any error occurs then it can be easily maintained by the software developer.

3.9 DATABASE REQUIREMENTS

• Firebase

3.10 SOFTWARE REQUIREMENTS

1. ARDUINO IDE

Figure 3.1: ARDUINO IDE

Arduino IDE is an open-source software development environment used for programming Arduino microcontroller boards. It is a cross-platform application that runs on Windows, Mac OS X, and Linux operating systems.

Arduino IDE provides a simple and easy-to-use interface for writing, compiling, and uploading code to Arduino boards. It includes a text editor for writing code, a compiler for converting code into machine language, and a bootloader for uploading code to the boarThe Arduino IDE is based on the Wiring programming language and is designed to be easy to learn for beginners. It provides a standard library of functions for interacting with the hardware of the board, making it easy to control sensors, motors, and other devices.

The IDE supports a variety of programming languages, including C and C++, and includes advanced features such as syntax highlighting, code completion, and code templates. It also includes a serial monitor for debugging and testing code on the board.

2. ANDRIOD STUDIO

Figure 3.2: ANDIOD STUDIO

Android Studio is a powerful integrated development environment (IDE) specifically designed for building Android applications. It provides developers with a comprehensive set of tools and resources to streamline the entire app development process, from designing user interfaces to testing and debugging code.

With its intuitive interface and extensive features, Android Studio offers functionalities such as code completion, refactoring, and version control integration, enabling developers to write high-quality, efficient code more effectively. Moreover, Android Studio's built-in emulators and real-time device testing capabilities simplify the process of testing applications across various screen sizes and Android versions, ensuring optimal performance and compatibility.

Overall, Android Studio empowers developers to create innovative and engaging Android apps with ease, contributing to the vibrant ecosystem of mobile technology.

3.11 HARDWARE REQUIREMENTS

1. ESP32

Figure 3.3: ESP 32 PIN DIAGRAM

The ESP32 is a highly versatile and powerful microcontroller developed by Espressif Systems, designed specifically for Internet of Things (IoT) and embedded systems applications. At its core, the ESP32 features a 32-bit dual-core Tensilica Xtensa LX6 microprocessor, capable of operating at up to 240 MHz clock speed, providing ample processing power for a wide range of tasks.

The microcontroller packs 520 KB of SRAM for data and instruction storage, as well as 448 KB of ROM and up to 16 MB of external flash memory for program storage. One of the standout features of the ESP32 is its robust connectivity options.

It supports both 2.4 GHz and 5 GHz Wi-Fi networks, adhering to the 802.11 b/g/n/e/i protocols, enabling seamless wireless communication with various devices and networks. Additionally, the microcontroller includes a Bluetooth 4.2 BR/EDR and BLE (Bluetooth Low Energy) radio, further expanding its wireless capabilities and enabling communication with a wide range of Bluetooth-enabled devices.

The ESP32 is equipped with a rich set of peripheral interfaces, including

34 GPIO (General Purpose Input/Output) pins that can be used for digital input/output, analog input, and communication protocols. It also features SPI (Serial Peripheral Interface), I2C (Inter-Integrated Circuit), and UART (Universal Asynchronous Receiver/Transmitter) interfaces for communication with other devices, as well as ADC (Analog-to-Digital Converter) and DAC (Digital-toAnalog Converter) for analog signal processing.

Power management is a crucial aspect of the ESP32, and it supports various power modes, including deep sleep mode, to conserve battery life in low-power applications. The microcontroller can be powered using a USB port or an external power source ranging from 2.3V to 3.6V. Furthermore, the ESP32 incorporates robust security features, including a hardware-accelerated encryption engine supporting AES, SHA, RSA, and other cryptographic algorithms, as well as secure boot and flash encryption capabilities for enhanced security.

The ESP32 can be programmed using the Arduino IDE or the Espressif IoT Development Framework (ESP-IDF), which supports multiple programming languages such as C, C++, and Python.

2. DHT-11 SENSOR

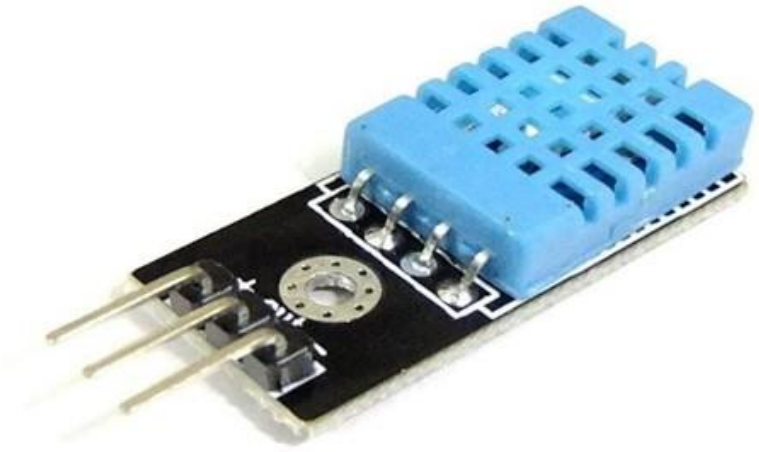


Figure 3.4: DHT-11 SENSOR

The DHT11 sensor is a widely used digital temperature and humidity sensor that can be interfaced with an Arduino microcontroller or other microcontrollers. The sensor is low cost and comes in a compact form factor, making it suitable for various applications.

The DHT11 sensor consists of a capacitive humidity sensor and a thermistor for temperature measurement. The sensor provides a digital output with a 1-wire protocol that can be read by an Arduino. The sensor operates on a voltage range of 3.3V to 5V and has a temperature range of 0°C to 50°C with an accuracy of ±2°C.

The DHT11 sensor is relatively easy to use and can be interfaced with an Arduino using a library such as the Adafruit DHT library. The library provides functions to read the temperature and humidity values from the sensor and also includes error checking to ensure data integrity

3. JUMPERS

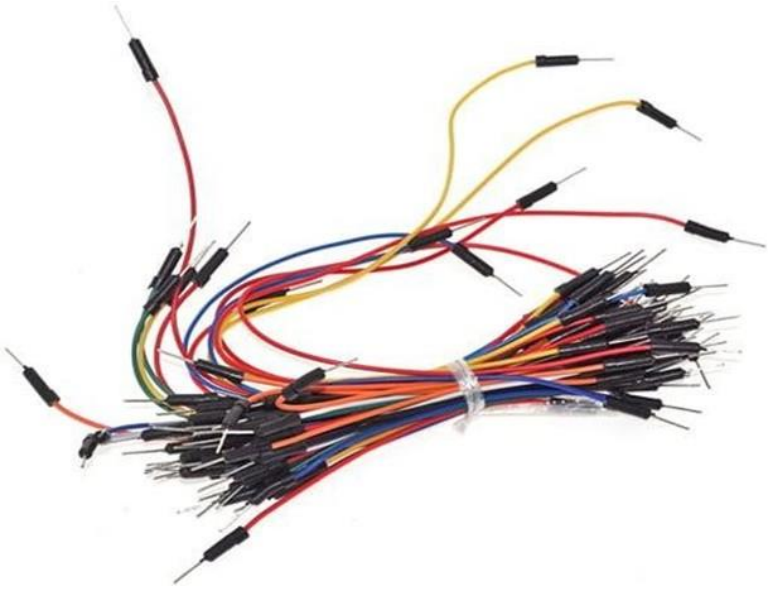


Figure 3.5: JUMPERS

Jumpers, also known as jumper wires, are a type of electrical wire used to make temporary connections between electronic components on a breadboard or PCB (printed circuit board). They are typically made of a flexible wire with a small metal pin at each end that can be inserted into holes on the breadboard or PCB to create an electrical connection.

Jumpers are commonly used in electronics prototyping and testing to quickly and easily connect components together without the need for soldering. They can be used to connect components such as resistors, capacitors, and sensors to a microcontroller or other electronic device.

Jumpers come in various lengths and colors, making it easy to organize and identify different connections. Some jumpers also come with connectors such as female headers or alligator clips to make it easier to connect to different types of components.

While jumpers are useful for temporary connections during prototyping, they are not typically used in final production products.

4. SOUND SENSOR

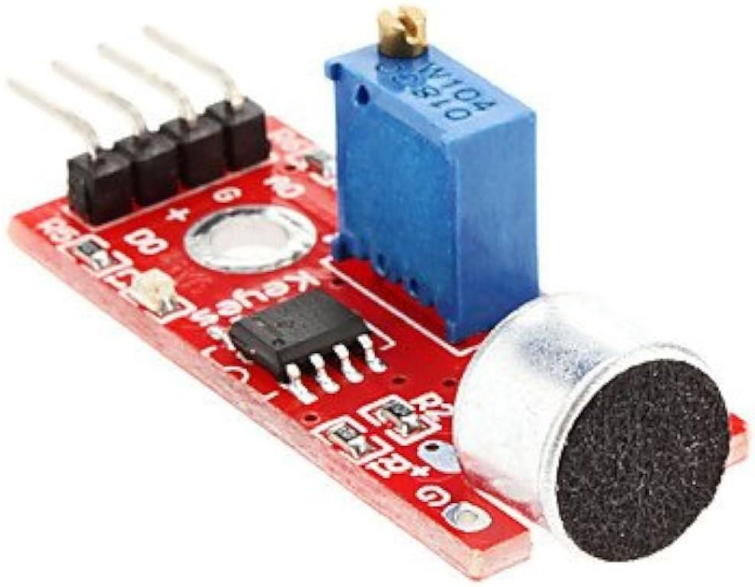


Figure 3.6: SOUND SENSOR

A sound sensor, also referred to as a sound detector or acoustic sensor, is a device designed to detect sound waves in its surrounding environment and convert them into electrical signals. Typically composed of a microphone or condenser element, it captures variations in air pressure caused by sound and translates them into voltage fluctuations.

These voltage signals are then amplified and processed by the sensor's circuitry for further analysis. Sound sensors are widely utilized across diverse fields, including security systems, smart home automation, industrial monitoring, and consumer electronics.

They play a pivotal role in applications such as noise detection and control in manufacturing facilities, intrusion detection in security systems, voice-activated commands in smart devices, and environmental monitoring for measuring noise pollution levels. Whether integrated into microcontrollers for DIY projects or incorporated into sophisticated industrial systems, sound sensors enable real-time detection.

5. BUZZER

Figure 3.7: BUZZER

A buzzer is an electroacoustic transducer that generates audible sound waves when an electrical signal is applied to it. It typically consists of a coil of wire (acting as an electromagnet) and a diaphragm or speaker cone attached to a frame.

When an alternating current (AC) or pulsed direct current (DC) is passed through the coil, it creates a magnetic field that interacts with a permanent magnet or another magnetic component, causing the diaphragm to vibrate. These vibrations produce sound waves, resulting in an audible tone or buzzing sound.

Buzzer devices are commonly used in a wide range of applications, including alarms, timers, notification systems, and electronic games. They come in various sizes, shapes, and types, including piezoelectric buzzers (which use the piezoelectric effect to produce sound) and electromagnetic buzzers (which use electromagnetism).

6. SENSOR BOARD

Figure 3.8: SENSOR BOARD

Above Figure 10 shows a Sensor Board, which used for microcontrollers, and Internet of Things (IoT) applications. The board is designed by Go-Green Mobile IoT Lab, as indicated at the bottom. The board features various components and interfaces, including:

1. Microcontroller: It likely has a microcontroller or microprocessor unit (CPU) for running programs and controlling the board's functionality.

2. Display: There is an LCD display for displaying information and data.

3. Input/Output (I/O) interfaces: The board has numerous connectors and headers for interfacing with various sensors, actuators, and peripheral devices. These include headers for relays, servo motors, motor drivers, analog inputs, digital I/O pins, and communication interfaces like UART, SPI, and I2C

4. Power supply: It has provisions for connecting different power sources, such as a DC power supply and a battery.

3.12 ANALYSIS MODULE. SDLC MODULE TO BE APPLIED

Waterfall Model is a sequential model that divides software development into different phases. Each phase is designed for performing specific activity during SDLC phase. It was introduced in 1970 by Winston Royce. This is used for our project. This model is simple and easy to understand and use. It is easy to manage due to the rigidity of the model each phase has specific deliverables and a review process. Waterfall model works well for smaller projects where requirements are clearly defined and very well understood.

3.13 OVERVIEW OF RESPONSIBILITIES OF DEVELOPER

- To know what are the hardware and software requirements of system.
- To have understanding of proposed system.
- To do planning various activates with the help of planner.
- Designing, programming, testing etc.

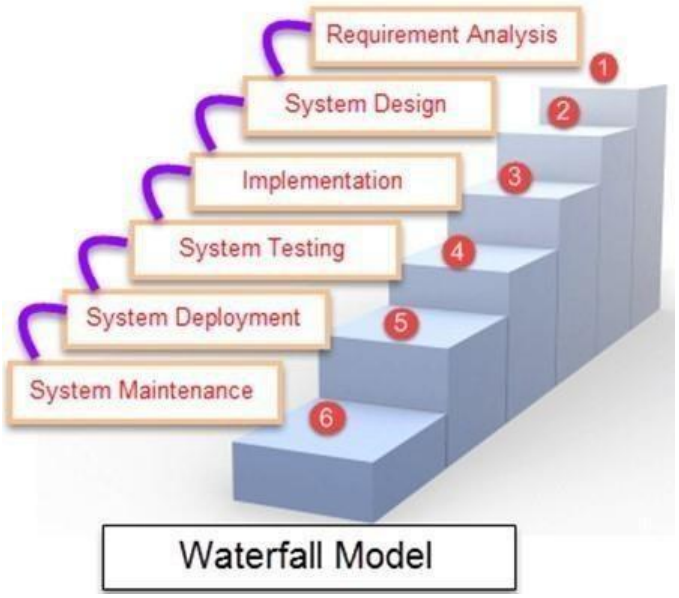


Figure 3.9: Waterfall Model

Chapter 4

SYSTEM DESIGN

1. System Architecture

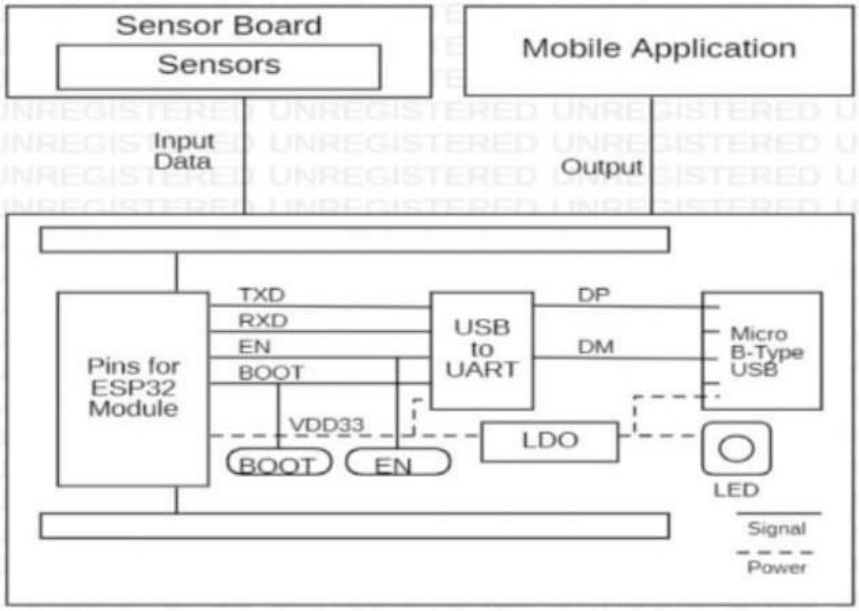


Figure 4.1: System Architecture

The IoT-based smart learning system consists of interconnected devices and sensors that collect and process data to improve learning outcomes. The architecture is designed to support various educational activities, provide real-time feedback, and enable seamless communication between devices and users.

The system architecture of an IoT-based smart learning system outlines the structure and interaction of various components to facilitate an enhanced educational experience. This architecture integrates hardware and software.

2. UML Diagrams:

Unified Modeling Language is a standard language for writing software blueprints. The UML may be used to visualize, specify, construct and document the artifacts of a software intensive system.UML is process independent, although optimally it should be used in process that is use case driven, architecturecentric, iterative, and incremental. The Number of UML Diagram is available.

- Use case Diagram.
- Activity Diagram.
- Sequence Diagram.
- DFD 0
- DFD 1
- Flow Diagram

1. Use Case Diagram:

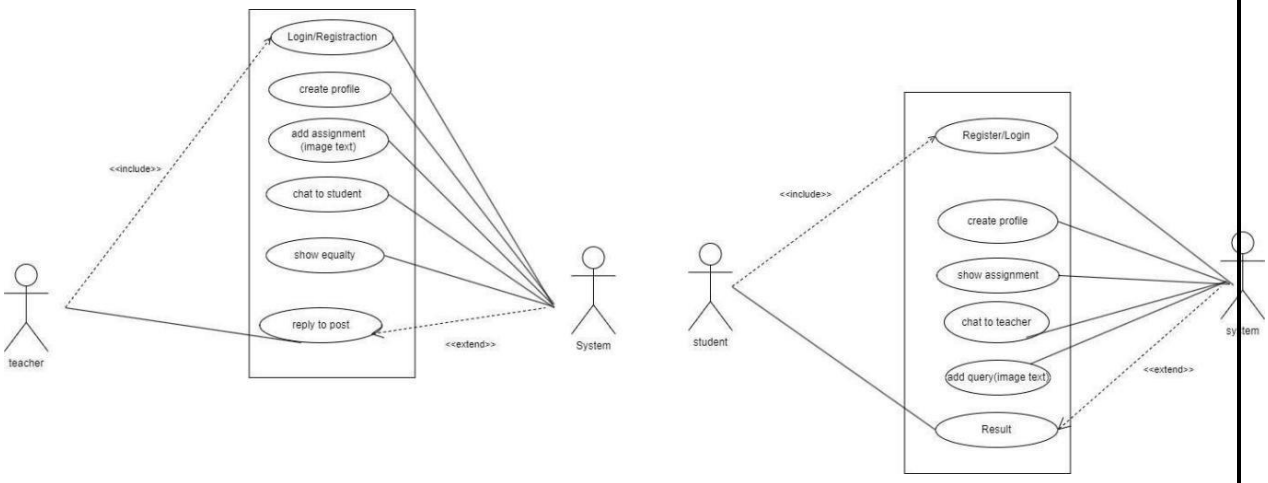


Figure 4.2: **Use case Diagram**

2. Activity Diagram

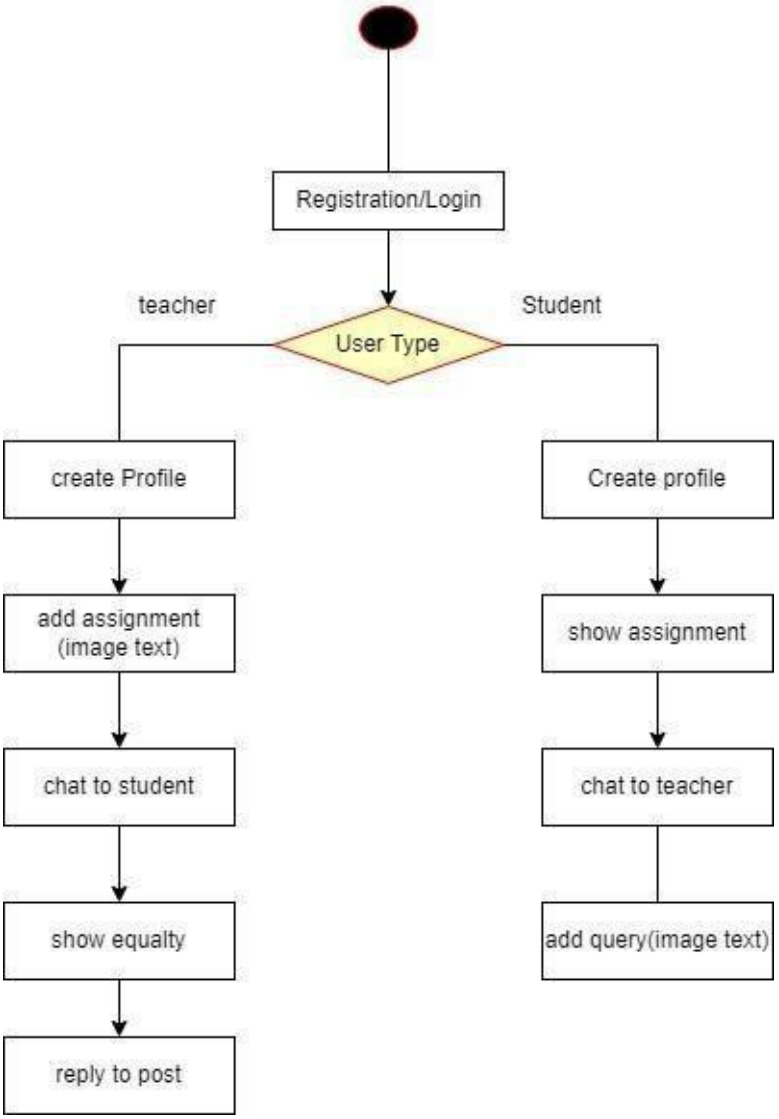


Figure 4.3: **Activity Diagram**

3. Sequence Diagram

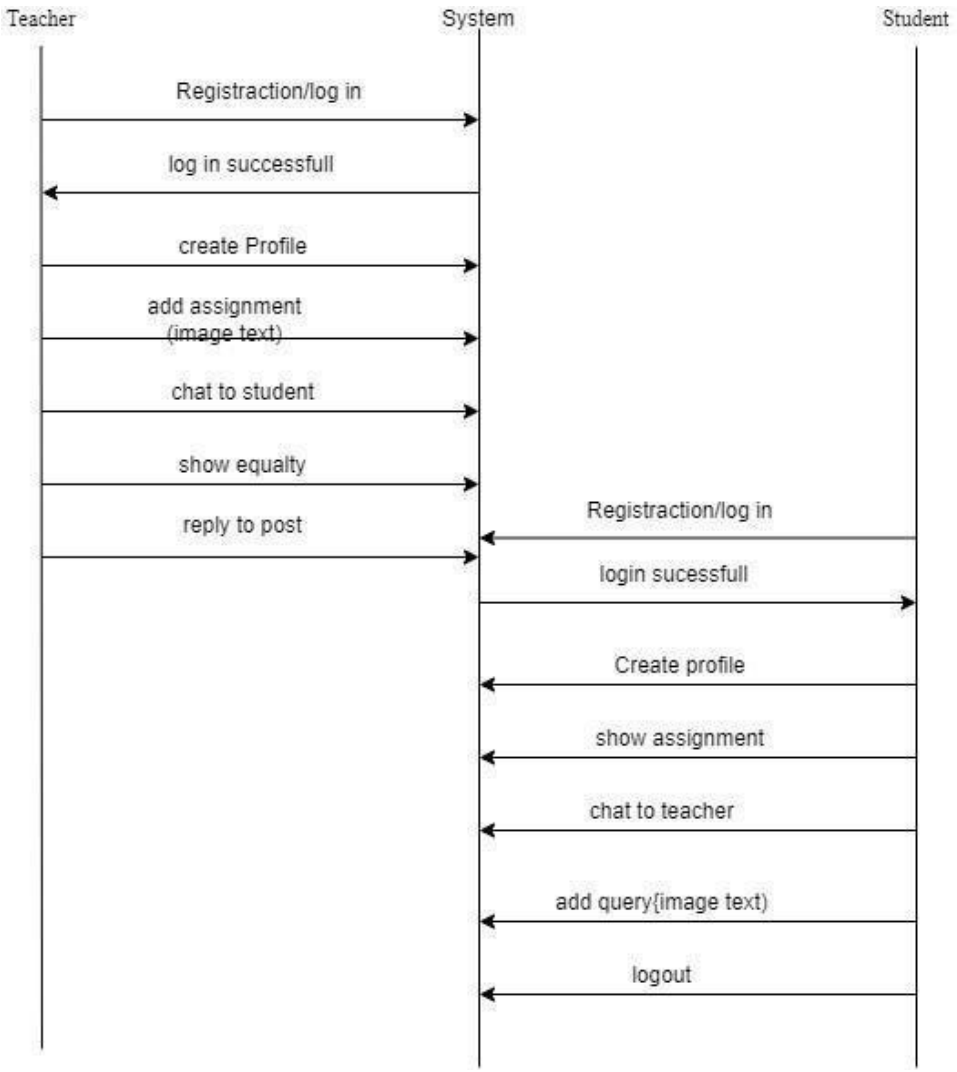


Figure 4.4: **Sequence Diagram**

4. Class Diagram

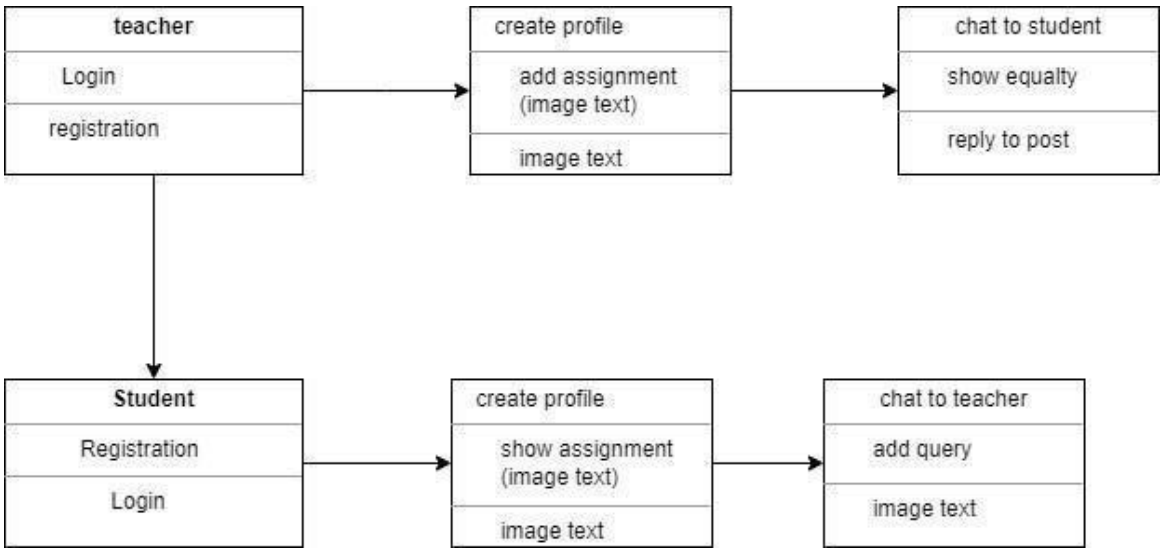


Figure 4.5: **Class Diagram**

5. Flow Diagram

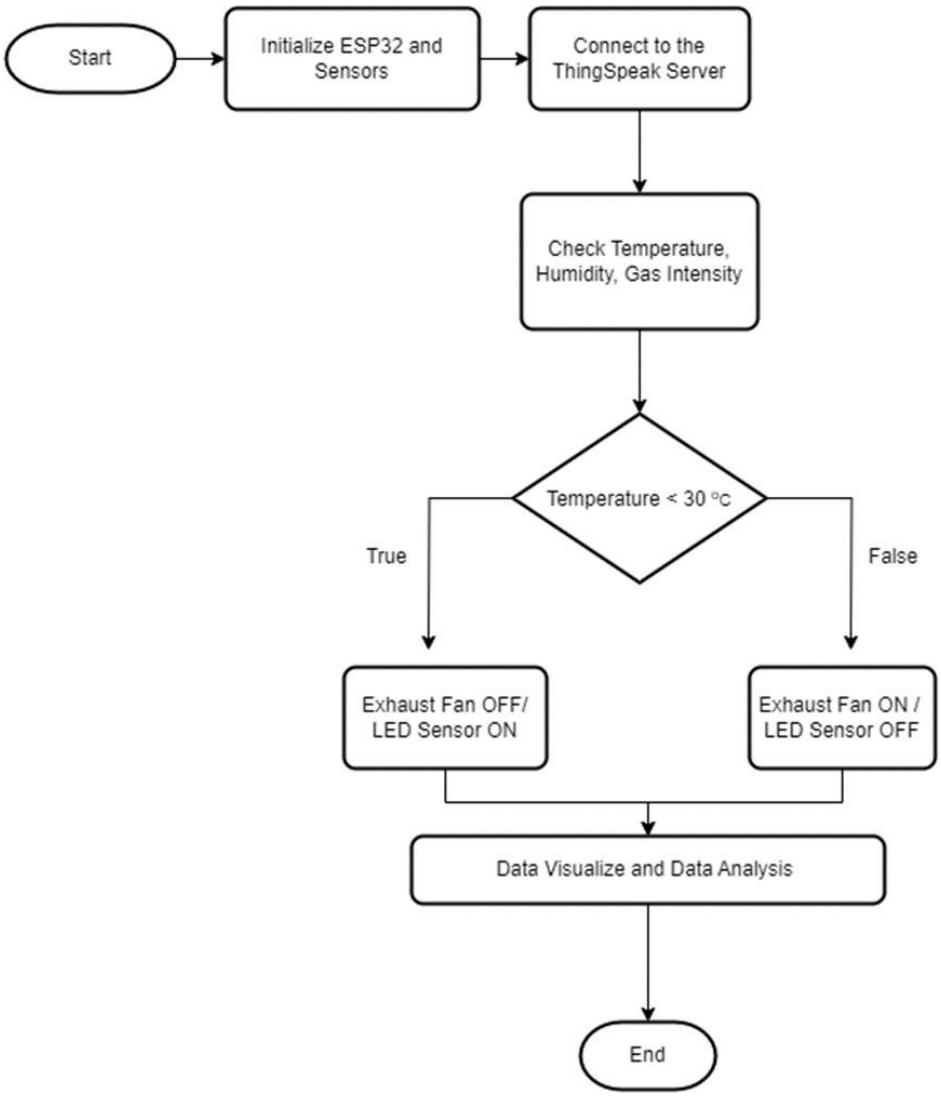


Figure 4.6: **Flow Diagram**

33. **DFD-**

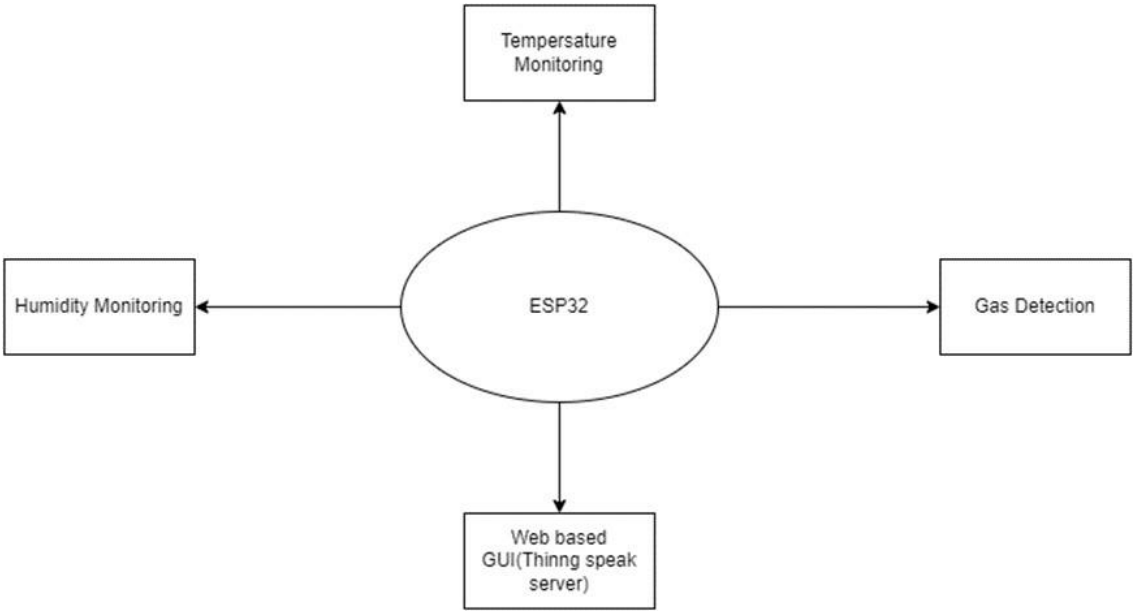


Figure 4.7: DFD-0

34. **DFD-**

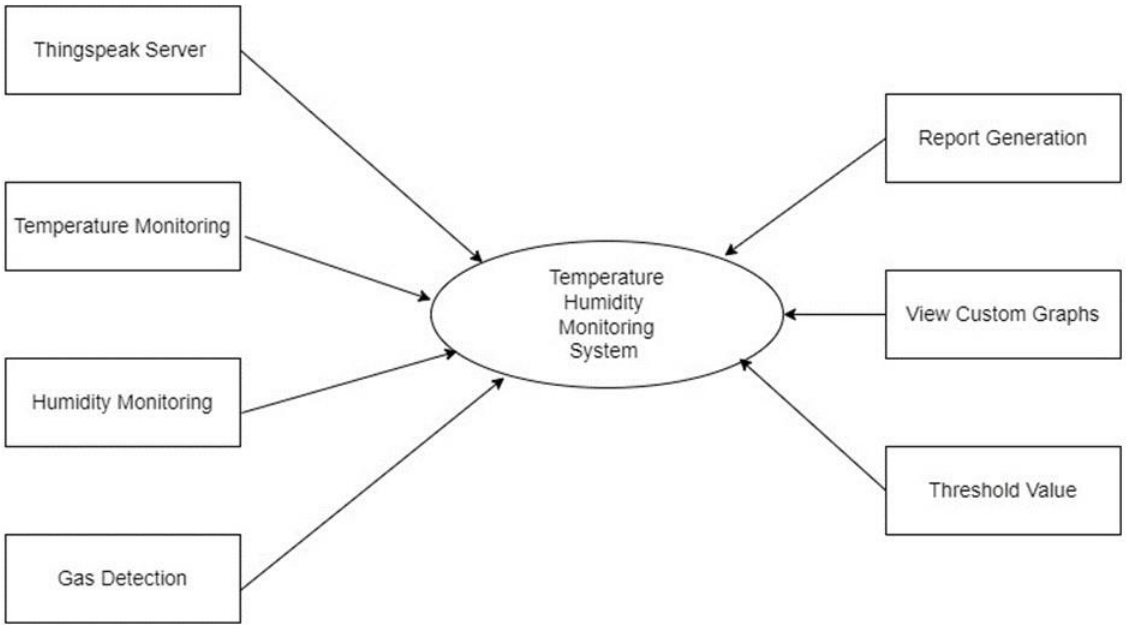


Figure 4.8: **DFD-1**

Chapter 5

PROJECT PLAN

Creating a project plan for developement of an “IOT Based Smart Learning System” a learning app is a software application designed to facilitate and enhance the process of learning, whether it’s for educational purposes, personal development, skill acquisition, or any other form of knowledge acquisition. Learning apps have become increasingly popular due to the widespread use of smartphones and the need for convenient and accessible ways to acquire knowledge.

5.1 PROJECT ESTIMATE

We are using waterfall model for our project esti

1. **Requirement gathering and analysis:** In this step of waterfall we identify what are various requirements are need for our project such are software and hardware required, database, and interfaces.

2. **System Design:** In this system design phase we design the system which is easily understood for end user i.e. user friendly. We design some UML diagrams and data flow diagram to understand the system flow and system module and sequence of execution.

3. **Implementation:** In implementation phase of our project we have implemented various module required of successfully getting expected outcome at the different module levels. With inputs from system design, the system is first developed in small programs called units, which are integrated in the

next phase. Each unit is developed and tested for its functionality which is referred to as Unit Testing.

4. **Testing:** The different test cases are performed to test whether the project module are giving expected outcome in assumed time. All the units developed in the implementation phase are integrated into a system after testing of each unit. Post integration the entire system is tested for any faults and failures.

5. **Deployment of System:** Once the functional and non-functional testing is done, College Short Form Name, Department of Computer Engineering 2023-24 the product is deployed in the customer environment or released into the market.

6. **Maintenance:**

   There are some issues which come up in the client environment. To fix those issues patches are released. Also to enhance the product some better versions are released. Maintenance is done to deliver these changes in the customer environment. All these phases are cascaded to each other in which progress is seen as flowing steadily downwards like a waterfall through the phases. The next phase is started only after the defined set of goals are achieved for previous phase and it is signed off, so the name ”Waterfall Model”. In this model phases do not overlap

5.2 RISK MANAGEMENT

1. In appropriate dataset -To overcome this risk we are trying to use well organized and complete dataset.

2. Security- To overcome and improving security we use multilevel security like access permissions of user.

1. **Risk Identification:** 1. Have top software and customer managers formally committed to support the project? Ans-Not apllicaable.

   2. Are end-users enthusiastically committed to the project and the system/product to be built? Ans-Not known at this time.

   3. Are requirements fully understood by the software engineering team and its customers? Ans-Yes

   4. Have customers been involved fully in the definition of requirements? Ans-Not applicable

   5. Do end-users have realistic expectations? Ans-Not applicable

   6. Does the software engineering team have the right mix of skills? Ans-yes

   7. Are project requirements stable? Ans-Not applicable

   8. Is the number of people on the project team adequate to do the job? Ans-Not applicable

2. **Risk Analysis: Risk Table:**

ID	RISK DISCRIPTION	PROBABILITY	SCHEDULE	QUALITY
1	CORRECTNESS	LOW LOW	LOW	HIGH
2	AVAILABILITY	HIGH HIGH	LOW	HIGH

3. Risk Probability definitions:

PROBABILITY	VALUE	DESCRIPTION
HIGH	PROBABILITY OF OCCURENCE	>75%
MEDIUM	PROBABILITY OF OCCURENCE	26-75%
LOW	PROBABILITY OF OCCURENCE	<25%

4. Overview of Risk Mitigation, Monitoring, Management:

Risk ID	1
Risk Description	Loss of data
Category	Environment
Source	Shoulder surfing
Probability	High
Impact	High
Response	Mitigate
Strategy	Break

5.3 PROJECT SCHEDULE

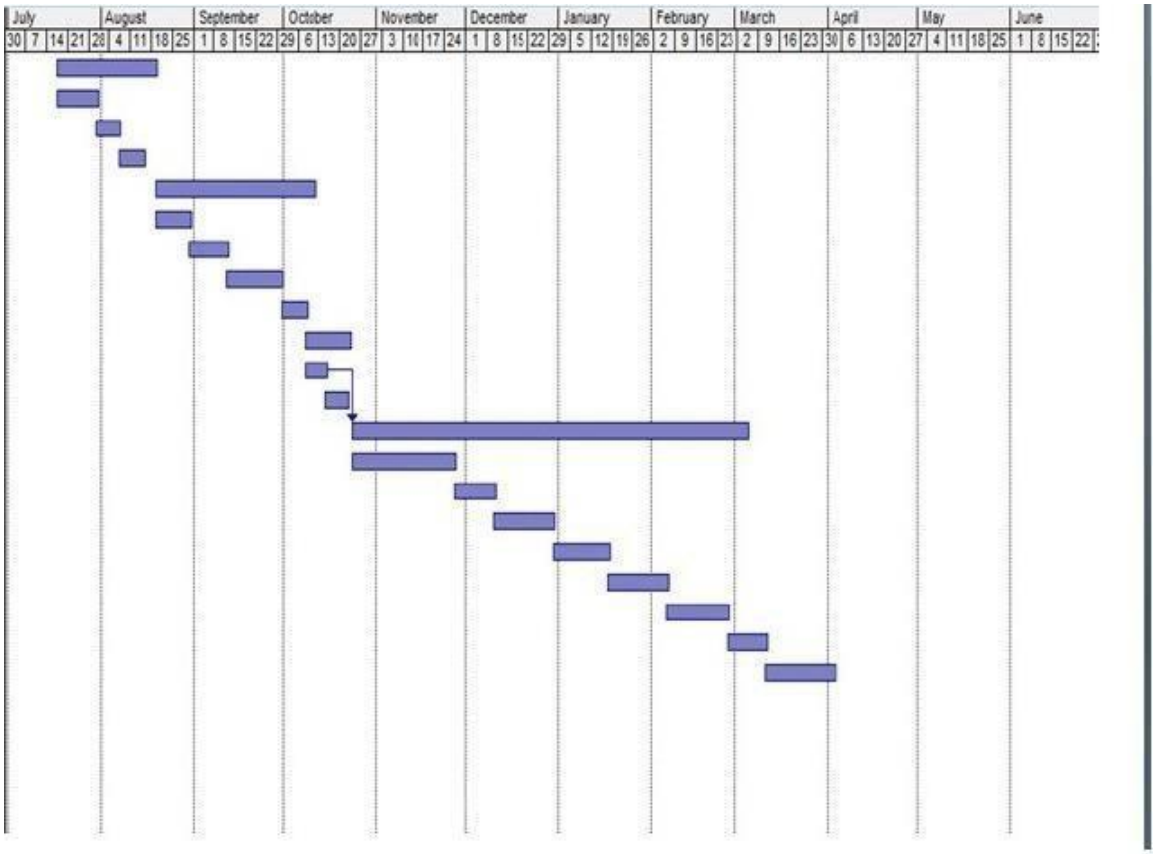
1. **Project Task Set:** Major Tasks in the Project stages are:

   Task 1: correctness

   Task 2: availability

   Task 3: integrity

2. **Timeline Chart:**



3. **Team structure:** The team structure for the project is identified. There are total 4 members in our team and roles are defined..

Month Scheduled	**Phase**	**Work done**
June-August	Topic searching	Topic Searched
August-September	Topic selection	Topic Selected
August-September	Project confirmation	Project Confirmed
August-September	Literature Sur-Vey	Literature Sur-vey Done
September- October	Requirement Analysis	Requirement Analysis Done
September-October	Requirement Gathering	Requirements Gathered
November-December	Designing	Architecture Design
November-December	Designing Test	GUI Tested
November-December	Database Creation	Database Tested
January-February	Database And Modules Connectivity	Connectivity Done
March	Testing of project	Project Tested

Chapter 6

SOFTWARE TESTING

1. **Purpose:**

   Chatbots can provide customers with their bank balances, check account information, and even make personalized product recommendations based on the customer's financial situation.

2. **Scope of Testing:**

   Software testing, depending on the testing method employed, can be implemented at any time in the development process. However, most of the test effort occurs after the requirements have been defined and the coding process has been completed. As such, the methodology of the test is governed by the software development methodology adopted. Different software development models will focus the test effort at different points in the development process. Newer development models, such as Agile, often employ test driven development and place an increased portion of the testing in the hands of the developer, before it reaches a formal team of testers. In a more traditional model, most of the test execution occurs after the requirements have been defined and the coding process has been completed.

6.1 SOFTWARE TO BE TESTED

1. **Edraw Max:**

   It enables students, teachers and business professional store liable create and publish various kinds of diagram store present any ideas. With this applica-

tion users can easily create professional- looking flow charts, organizational charts, network diagrams, business presentations, building plans, mind maps, science illustration, fashion designs, UML diagrams and much more.

2. **Star UML**

   Star UML is a fully fledged, open source, UML modeling tool thats supports the ability to create software designs, from basic concepts, through to the coded solution. The user should be aware that this tool is more complex than a simple UML diagram editing tool, in that, through the use of the model Drive Architecture (MDA) standard, the tool supports complex modeling which is realizable in code.

3. **Test Plan:**

   To test this application we are going with proper sequencing of testing like unit, integration, validation, GUI, Low level and High level test cases, major scenarios likewise. We will go with the GUI testing first and then integration testing. After integration testing performs the high level test cases and major scenarios which can affect the working on the application. We will perform the testing on the data transmitted using the various inputs and outputs and validate the results. It also intends to cover any deviations that the project might take from the initially agreed Test Strategy in terms of scope, testing methodology, tools, etc.. This test plan covers details of testing activities for this project and scope.

6.2 TYPE OF TESTING

1. **Unit Testing**

   It is the testing of individual software units of the application .it is done after the complexion of an individual unit before integration.Unit testing involves the design of test cases that validate that the internal program logic is functioning properly, and that program inputs produce valid outputs. All decision branches and internal code flow should be validated. This is a structural testing, that relies on knowledge of its construction and is invasive. Unit tests perform basic tests at component level and test a specific business process, application, and/or system configuration. Unit tests ensure that each unique path of a business process performs accurately to the documented specifications and contains clearly defined inputs and expected results.

2. **Regression Testing:**

   Regression testing is a software testing practice that ensures an application still functions as expected after any code changes, updates, or improvements. Regression testing is responsible for the overall stability and functionality of the existing features

3. **moke Testing**

   Smoke Testing comes into the picture at the time of receiving build software from the development team. The purpose of smoke testing is to determine whether the build software is testable or not. It is done at the time of ”building software.” This process is also known as ”Day 0”. It is a time-saving process. It reduces testing time because testing is done only when the key

features of the application are not working or if the key bugs are not fixed. The focus of Smoke Testing is on the workflow of the core and primary functions of the application.

4. System Testing

System Testing is a type of software testing that is performed on a complete integrated system to evaluate the compliance of the system with the corresponding requirements.

5. Integration Testing

Integration tests are designed to test integrated software components to determine if they actually run as one program. Testing is event driven and is more concerned with the basic outcome of screens or fields. Integration tests demonstrate that although the components were individually satisfaction, as shown by successfully unit testing, the combination of components is correct and consistent. Integration testing is specifically aimed at exposing the problems that arise from the combination of components.

6. Testing Strategy

Software testing methods are traditionally divided into white- and black-box testing. These two approaches are used to describe the point of view that a test engineer takes when designing test cases.

1. White-box testing

In white-box testing an internal perspective of the system, as well as programming skills, are used to design test cases.

2. Black-box testing

Black-box testing treats the software as a quot;black boxquot;, examining functionality without any knowledge of internal implementation. The testers are only aware of what the software is supposed to do, not how it does it.

3. Grey-box testing

Grey-box testing involves having knowledge of internal data structures and algorithms for purposes of designing tests, while executing those tests at the user, or black-box level. The tester is not required to have full access to the software.

6.3 TEST CASES

1. GUI Testing

GUI Testing:

Test case	Login Screen- Sign up
Objective	Click on sign up button then check all required/ mandatory fields with leaving all fields blank
Expected Result	All required/ mandatory fields should display with symbol "*". Instruction line "* field(s) are mandatory" should be displayed
Test case	Create a Password >>Text Box Confirm Password >>Text Box
Objective	Check the validation message for Password and Confirm Password field
Expected Result	Correct validation message should be displayed accordingly or "Password and confirm password should be same" in place of "Password mismatch".

8. Login Test Case

Login test case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter The Wrong username or password click on submit button	Username or password	Error comes	Error Should come	P
002	Enter the correct username and password click on submit button	Username and password	Accept	Accept	P

9. Registration Test Cases

Registration test case

Test Case ID	Test Case	Test Case I/P	Actual Result	Expected Result	Test case criteria(P/F)
001	Enter the number in username, middle name, last name field	Number	Error Comes	Error Should Comes	P
001	Enter the character in username, middle name, last name field	Character	Accept	Accept	p
002	Enter the invalid email id format in email id field	Kkgmail.com	Error comes	Error Should Comes	P
002	Enter the valid email id format in email id field	kk@gmail.com	Accept	Accept	P
003	Enter the invalid digit no in phone no field	99999	Error comes	Error Should Comes	P
003	Enter the 10 digit no in phone no field	9999999999	Accept	Accept	P

Chapter 7

OUTCOMES

Implementing a Learning Management System (LMS) based on Internet of Things (IoT) can lead to several significant outcomes. Here are some of the key outcomes:

1. **Enhanced Student Engagement and Learning Experience:** Personalized Learning: IoT devices can collect data on students' learning behaviors and preferences, allowing the LMS to tailor content and activities to individual needs. Interactive Learning: IoT-enabled devices such as smartboards, VR headsets, and other interactive tools can make learning

   more engaging and immersive.

2. **Improved Monitoring and Assessment:** Real-Time Monitoring: Teachers can track students' progress in real-time through IoT sensors and devices, identifying areas where students are struggling and providing timely support. Data-Driven Insights: IoT data analytics can provide detailed insights into student performance, helping educators to make informed decisions about curriculum adjustments and teaching strategies.

3. **Automated Administrative Processes:** Attendance Tracking: IoT devices can automatically record student attendance, reducing administrative burdens and minimizing errors. Resource Management: IoT can help in managing and optimizing the use of educational resources such as libraries, laboratories, and classroom facilities.

4. **Enhanced Security and Safety:**

   Campus Security: IoT devices can monitor and ensure the safety of students within the campus through surveillance systems and emergency response mechanisms. Device Security: The integration of secure IoT protocols ensures that student and institutional data is protected .

5. **Efficient Communication and Collaboration:**

   Seamless Communication: IoT-enabled LMS can facilitate better communication between students, teachers, and parents through integrated platforms that support messaging, alerts, and notifications. Collaborative Learning: IoT tools can support collaborative projects and group activities, enabling students to work

   together more effectively.

6. **Resource Optimization:**

   Energy Management: IoT systems can manage and optimize energy usage within educational institutions, contributing to sustainability and cost savings. Inventory Management: IoT can keep track of educational materials and equipment, ensuring.

7. **Accessibility and Inclusivity:** Assistive Technologies: IoT-enabled LMS can incorporate assistive technologies for students with disabilities, ensuring an inclusive learning environment. Remote Access: IoT allows for remote access to learning resources, supporting distance learning and ensuring that

   education is accessible to all students regardless of their location.

8. **Scalability and Flexibility:**

   Scalable Infrastructure: An IoT-based LMS can easily scale to accommodate a growing number of students and educational programs.

7.1 RESULTS:

1. **Login and Registration**

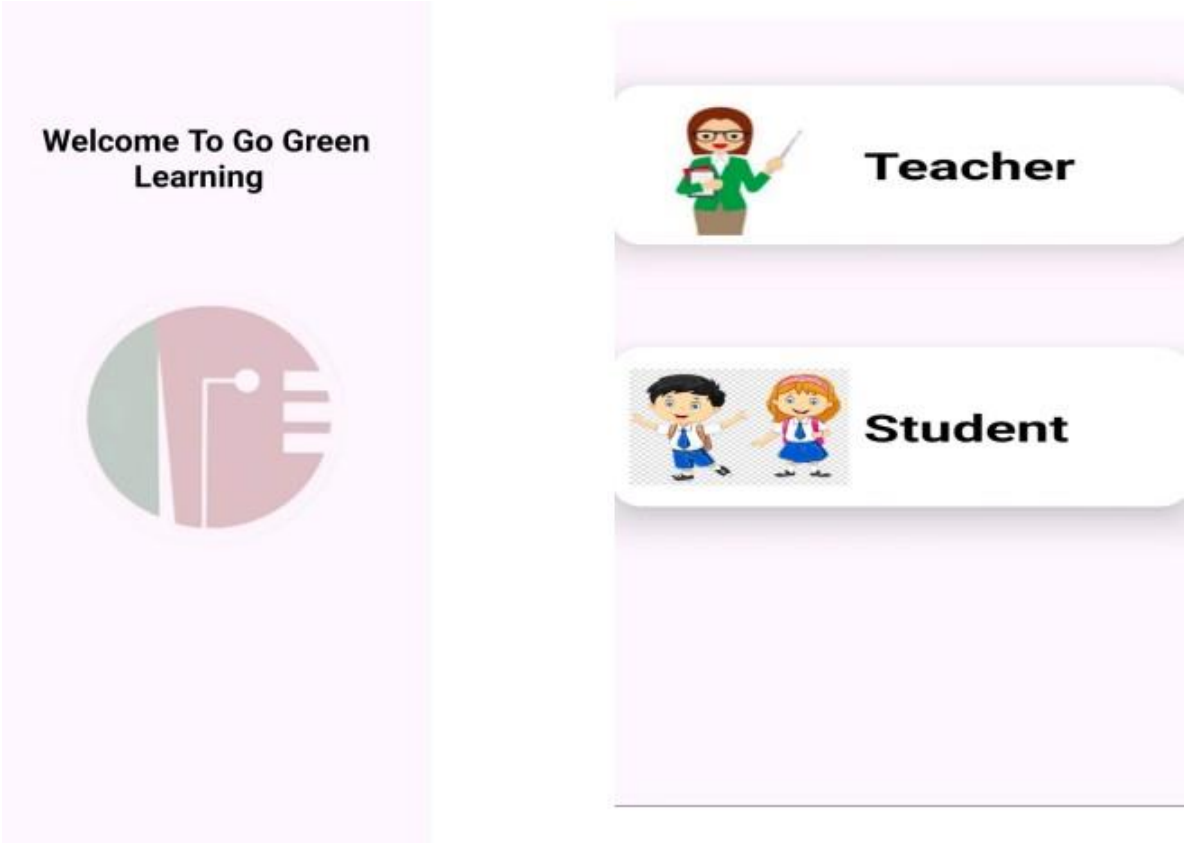


Figure 7.1: Login and Registration

For login, users are prompted to input their credentials, typically a username or email and a password. These credentials are then verified against the system's database.

Registration, on the other hand, enables new users to create accounts within the LMS ecosystem. They provide essential details such as name, email, and desired password.

Both login and registration processes are pivotal in ensuring a seamless and secure user experience within our IoT-based LMS, fostering engagement.

2. Student Login

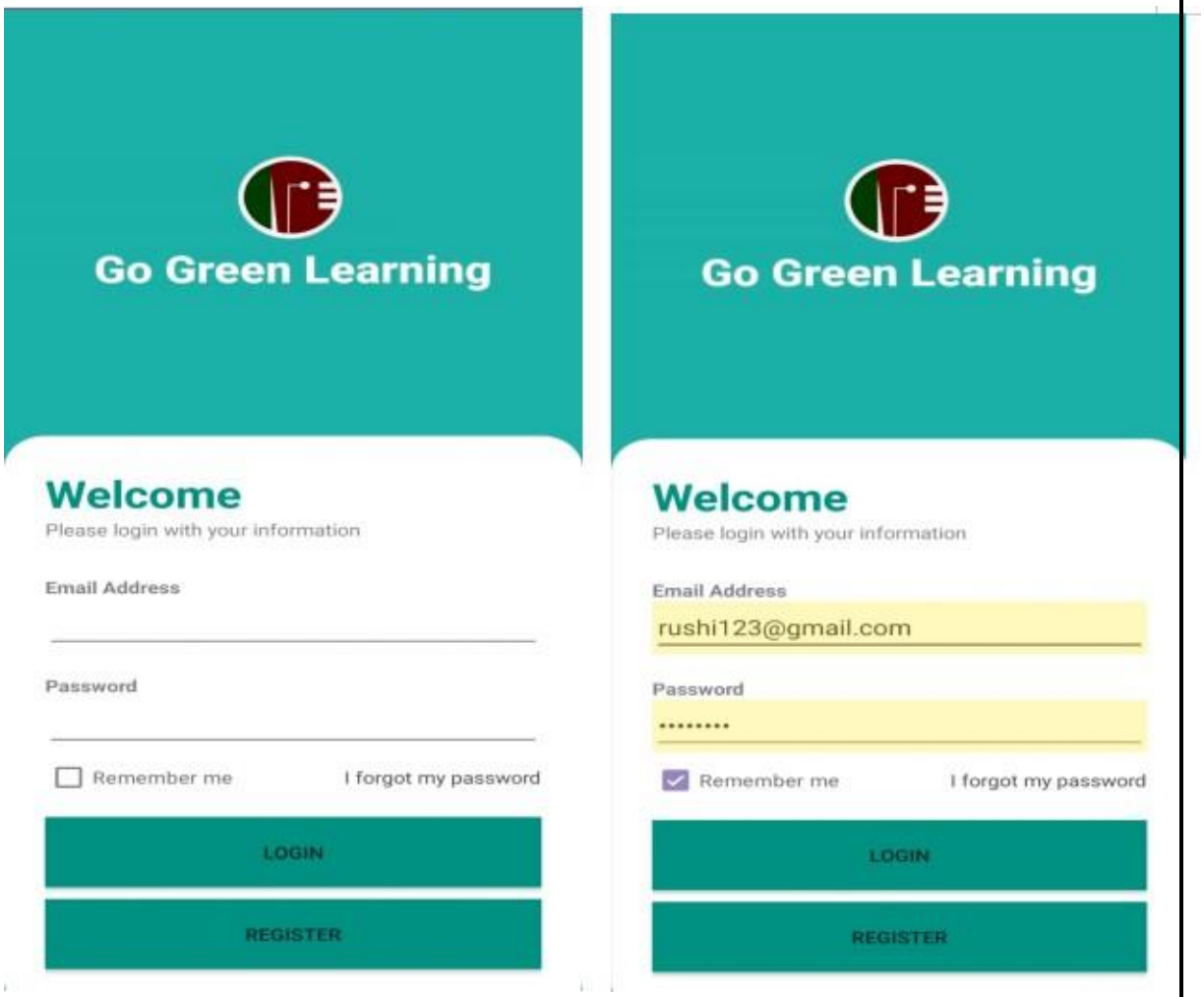


Figure 7.2: Student Login

In our Internet of Things (IoT) based Learning Management System (LMS) project, the student login interface serves as the primary entry point for learners into the platform's dynamic educational environment. Students input their unique credentials, typically a username and password, which are authenticated against the system's database. Upon successful verification, students gain access to personalized learning spaces tailored to their academic journey.

3. Dashboard

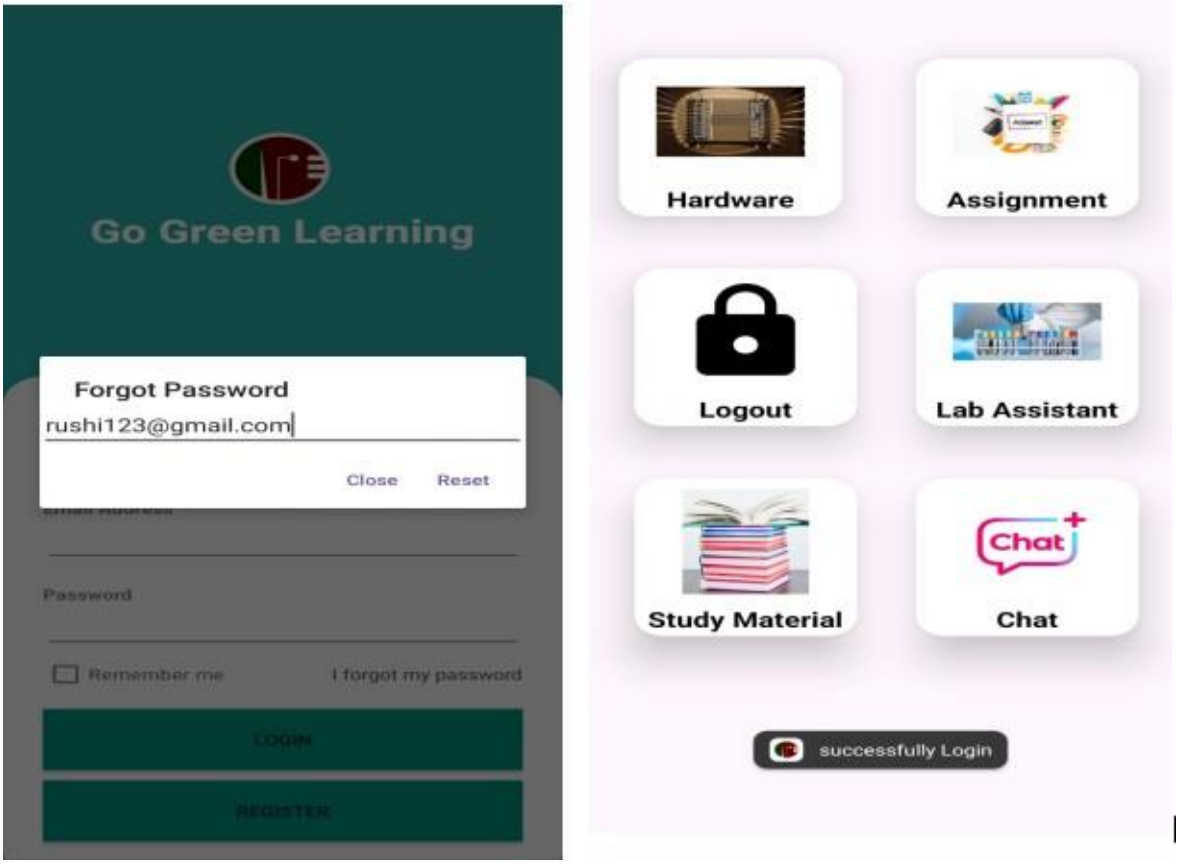


Figure 7.3: Dashboard

In our Internet of Things (IoT) based Learning Management System (LMS) project, the dashboard is the central hub where students and educators access a comprehensive overview of their learning activities and progress. Through intuitive design and real-time data integration, the dashboard provides students with personalized insights into their course schedules, upcoming assignments, and performance metrics. Leveraging IoT capabilities, the dashboard may also display relevant information such as real-time feedback from connected devices or sensors, fostering a dynamic and immersive learning experience.

4. Hardware Output

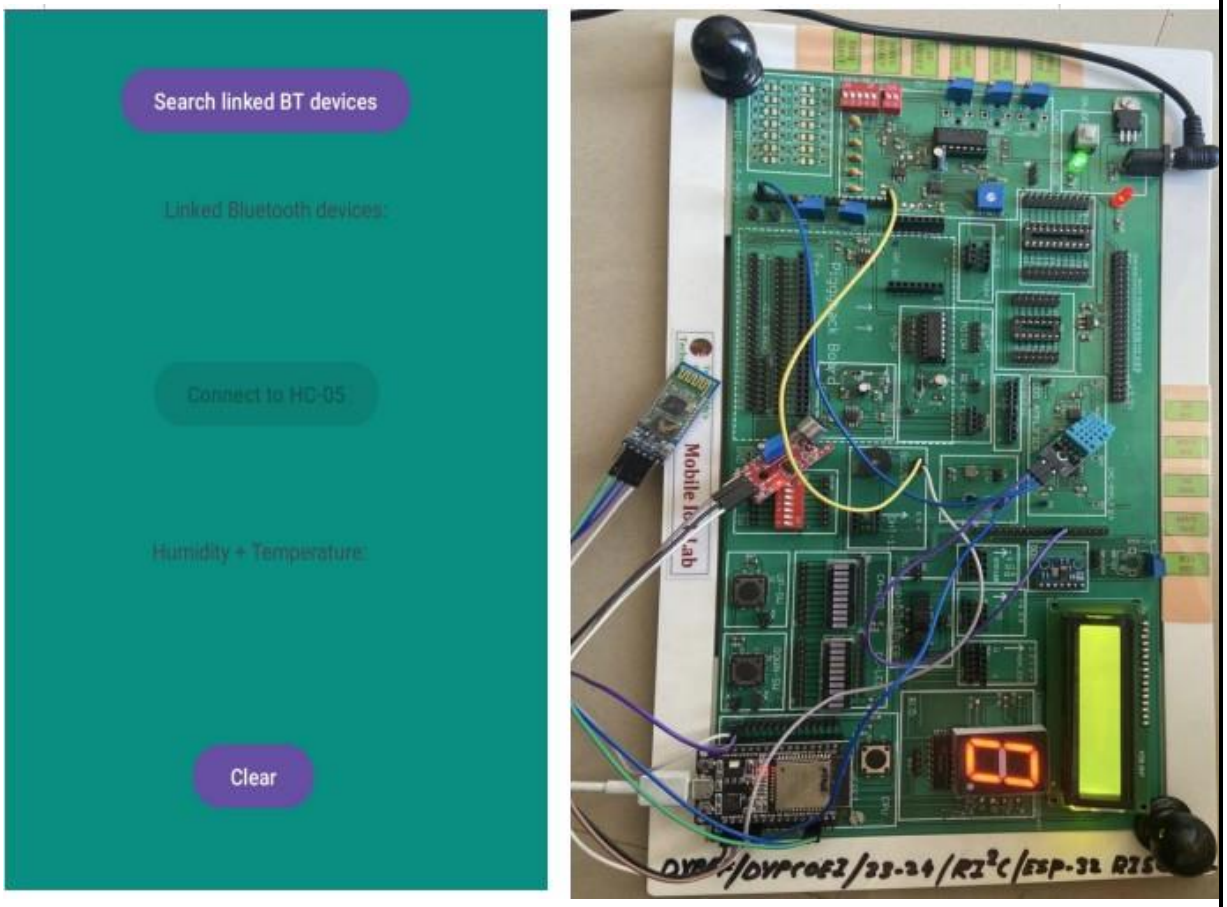


Figure 7.4: Hardware Output

In our Internet of Things (IoT) based Learning Management System (LMS) project, hardware output refers to the tangible results and interactions facilitated by IoT devices integrated into the educational environment. These devices may include sensors, actuators, or other connected hardware components that collect data from the physical world and provide feedback to enhance the learning experience. For instance, in a science course, temperature sensors linked to the LMS could enable students to monitor and analyze real-time temperature fluctuations in a laboratory experiment. Similarly, actuators could simulate physical phenomena or control equipment remotely.

5. Assignment

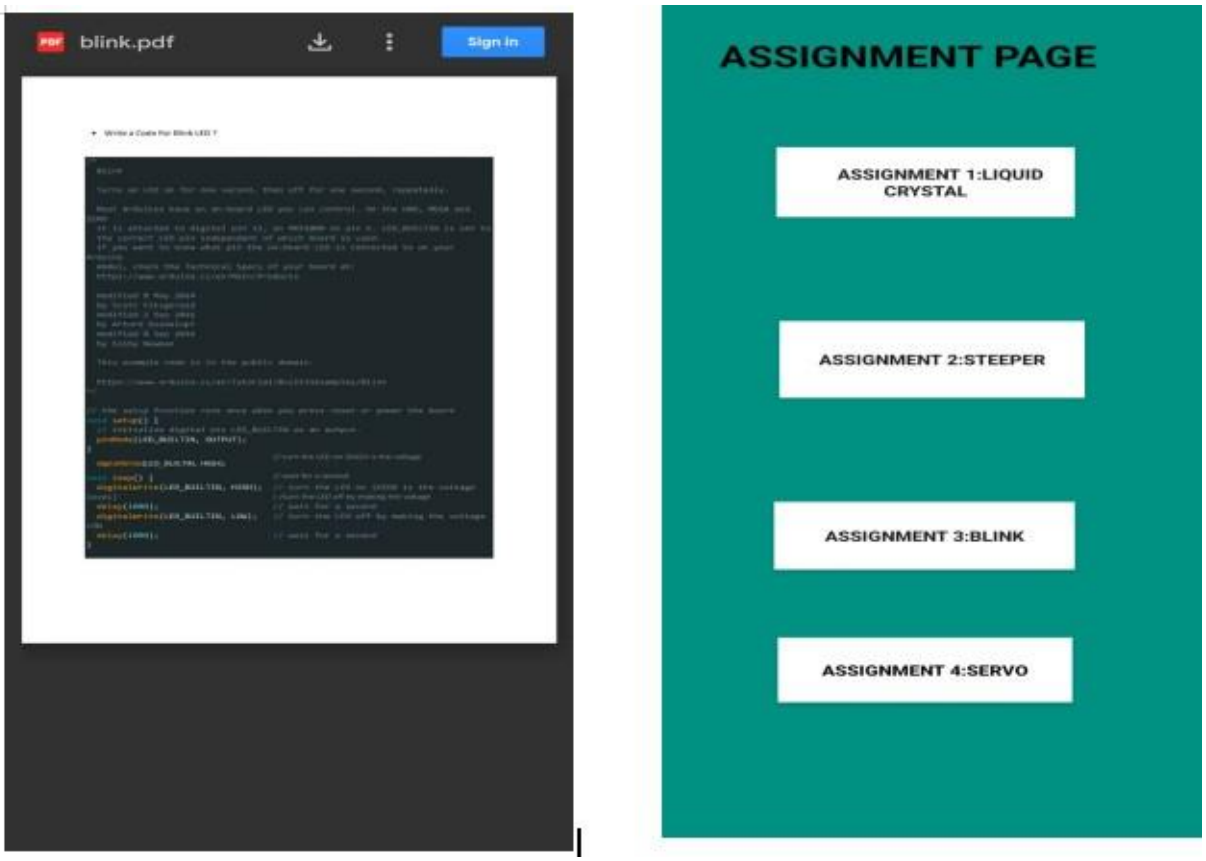


Figure 7.5: Assignment

In our Internet of Things (IoT) based Learning Management System (LMS) project, assignments play a pivotal role in fostering hands-on learning experiences and assessing students' understanding of course concepts. These assignments are designed to leverage IoT technology, challenging students to apply theoretical knowledge to real-world scenarios. For example, students may be tasked with designing and implementing IoT solutions to address specific problems, such as environmental monitoring or smart home automation. Through assignments, students not only deepen their understanding of IoT principles but also develop critical thinking, problem-solving, and collaboration skills essential for success in today's digital age.

6. Study Material

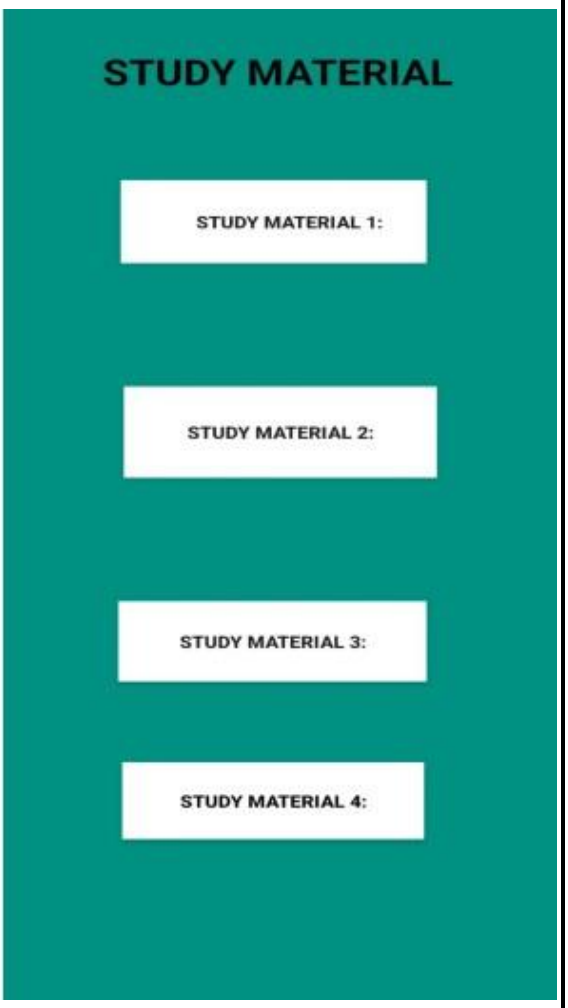


Figure 7.6: Study Material

In our Internet of Things (IoT) based Learning Management System (LMS) project, study materials constitute a comprehensive repository of resources designed to support students' understanding and mastery of IoT concepts. These materials encompass a diverse range of multimedia content, including text documents, video lectures, interactive simulations, and hands-on lab exercises. Leveraging the interactive capabilities of the LMS, students can access study materials anytime, anywhere, enabling flexible and self-paced learning.

7. Chat Login And Registration

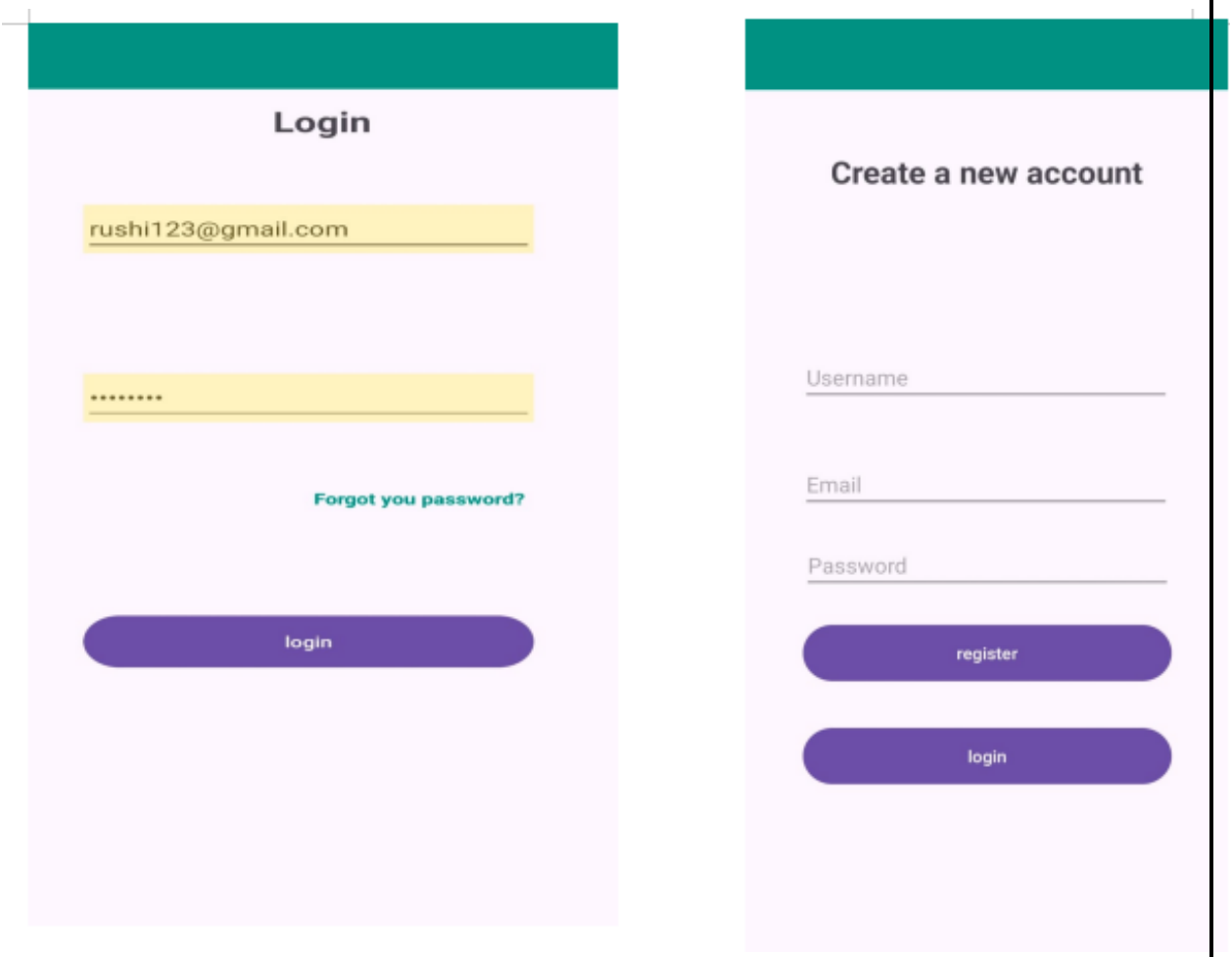


Figure 7.7: Chat Login And Registration

In our Internet of Things (IoT) based Learning Management System (LMS) project, the chat module's login and registration functionality serves as a vital means of communication and collaboration among students, instructors, and administrators. Through a seamless login process, users can access the chat module using their LMS credentials, fostering a sense of continuity and integration within the platform. Similarly, registration allows new users to join the LMS community and participate in group discussions, seek academic support, and share insights on IoT-related topics.

8. Chat Module

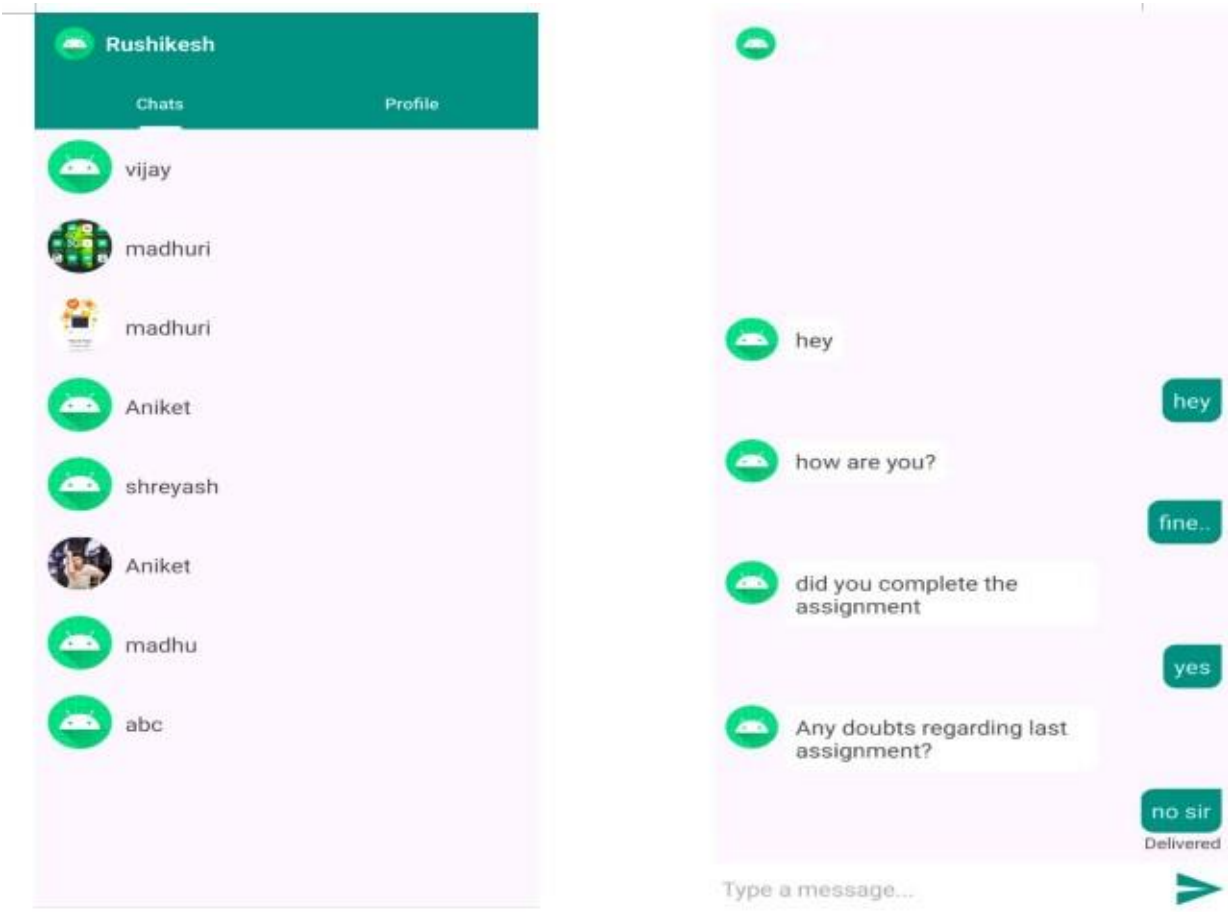


Figure 7.8: Chat Module

In our Internet of Things (IoT) based Learning Management System (LMS) project, the chat module serves as a dynamic communication hub, enabling real-time interaction and collaboration among students, instructors, and administrators. Through intuitive interface design and robust functionality, the chat module facilitates instant messaging, group discussions, and file sharing, fostering a sense of community and engagement within the LMS ecosystem. Leveraging IoT capabilities, the chat module may also integrate features such as presence detection or notification alerts based on user proximity, enhancing accessibility and responsiveness.

Chapter 8

CONCLUSION

To make the most of learning apps, it's essential to choose wisely, considering your educational objectives and preferred learning style. Learning apps should be viewed as a valuable supplement to traditional education and an effective tool for personal and professional development. By leveraging the advantages while being mindful of the limitations, users can harness the power of learning apps to expand their knowledge and skills in a digital age

The use of wireless sensor network technology allows for easy installation, scalability, and flexibility, enabling the system to adapt to changing monitoring needs. The integration of an sensor technology provides remote monitoring and control, adding to the system's convenience and accessibility.

The project's development process involved rigorous requirement analysis, system design, hardware and software implementation, and testing to ensure system reliability, accuracy, and efficiency. The use of open-source hardware and software components made the project cost- effective, and the system's simplicity makes it easy to maintain and upgrade.

8.1 FUTURE SCOPE:

- **Enhanced Personalization:** Enhanced personalization represents a significant future scope in our IoT-based Learning Management System (LMS) project, aiming to tailor the learning experience to the unique needs, preferences, and learning styles of individual users.

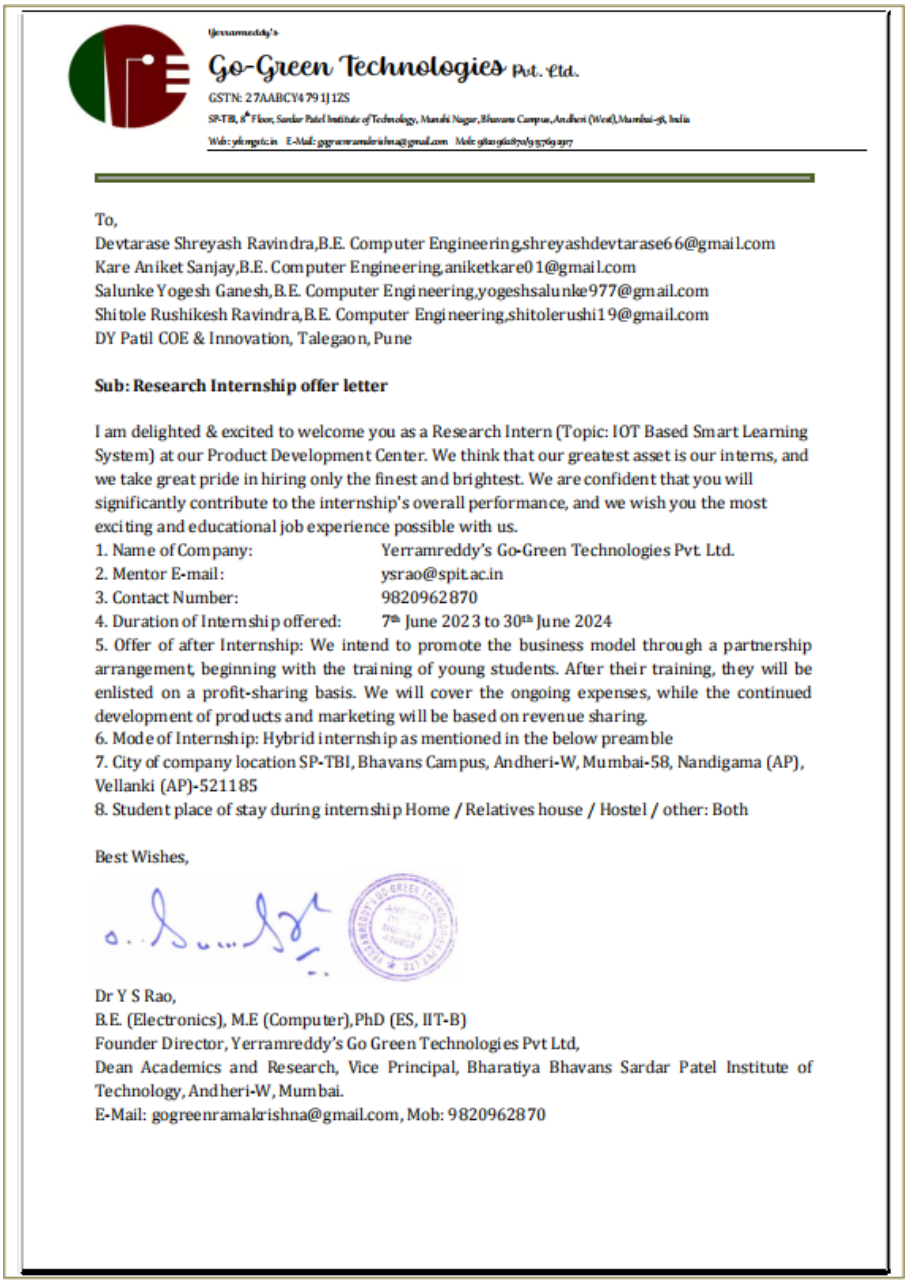
- **Emotion Recognition and Feedback:** Emotion recognition and feedback represent an innovative future scope in our IoT-based Learning Management System (LMS) project, offering a novel approach to enhancing student engagement, motivation, and overall learning outcomes.

- **Augmented and Virtual Reality Integration:** Augmented and Virtual Reality (AR/VR) integration represents an exciting future scope in our IoT-based Learning Management System (LMS) project, poised to revolutionize the way students engage with educational content and interact with their learning environment.

- **Blockchain for Data Security:** Implementing blockchain technology for data security represents an innovative and robust future scope in our IoT-based Learning Management System (LMS) project, offering unparalleled transparency, immutability, and integrity in data management.

- **Smart Learning Analytics** Integrating smart learning analytics into our IoT-based Learning Management System (LMS) project presents an exciting future scope aimed at leveraging data-driven insights to enhance teaching.

SPONSORSHIP LETTER



Yerramreddy's

Go-Green Technologies Pvt. Ltd.

GSTN: 27AABCY4791J1ZS

SP-TBI, 8th Floor, Sardar Patel Institute of Technology, Munshi Nagar, Bhavans Campus, Andheri (West), Mumbai-58, India

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To,
Devtarase Shreyash Ravindra,B.E. Computer Engineering,shreyashdevtarase66@gmail.com
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Shitole Rushikesh Ravindra,B.E. Computer Engineering,shitolerushi19@gmail.com
DY Patil COE & Innovation, Talegaon, Pune

Sub: Research Internship offer letter

I am delighted & excited to welcome you as a Research Intern (Topic: IOT Based Smart Learning System) at our Product Development Center. We think that our greatest asset is our interns, and we take great pride in hiring only the finest and brightest. We are confident that you will significantly contribute to the internship's overall performance, and we wish you the most exciting and educational job experience possible with us.

1. Name of Company: Yerramreddy's Go-Green Technologies Pvt. Ltd.
2. Mentor E-mail: ysrao@spit.ac.in
3. Contact Number: 9820962870
4. Duration of Internship offered: 7th June 2023 to 30th June 2024
5. Offer of after Internship: We intend to promote the business model through a partnership arrangement, beginning with the training of young students. After their training, they will be enlisted on a profit-sharing basis. We will cover the ongoing expenses, while the continued development of products and marketing will be based on revenue sharing.
6. Mode of Internship: Hybrid internship as mentioned in the below preamble
7. City of company location SP-TBI, Bhavans Campus, Andheri-W, Mumbai-58, Nandigama (AP), Vellanki (AP)-521185
8. Student place of stay during internship Home / Relatives house / Hostel / other: Both

Best Wishes,

Dr Y S Rao,
B.E. (Electronics), M.E (Computer), PhD (ES, IIT-B)
Founder Director, Yerramreddy's Go Green Technologies Pvt Ltd,
Dean Academics and Research, Vice Principal, Bharatiya Bhavans Sardar Patel Institute of Technology, Andheri-W, Mumbai.
E-Mail: gogreenramakrishna@gmail.com, Mob: 9820962870

8.2 PLAGIARISM REPORT

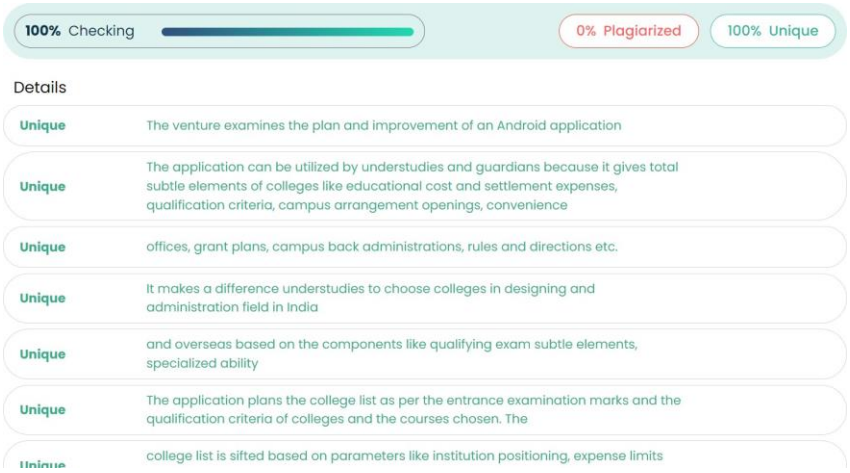

Figure 8.1: Plagiarism of Abstract

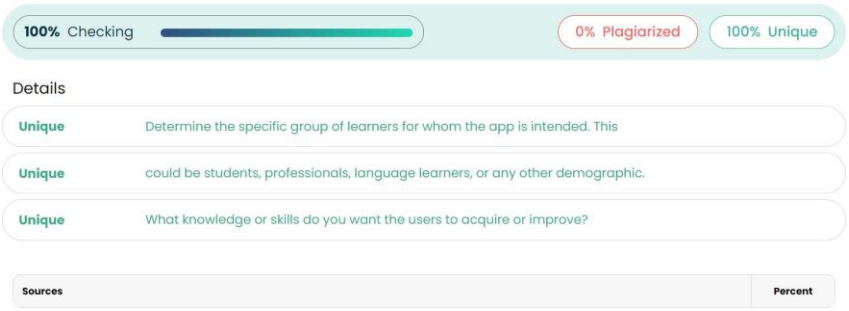

Figure 8.2: Plagiarism of Introduction

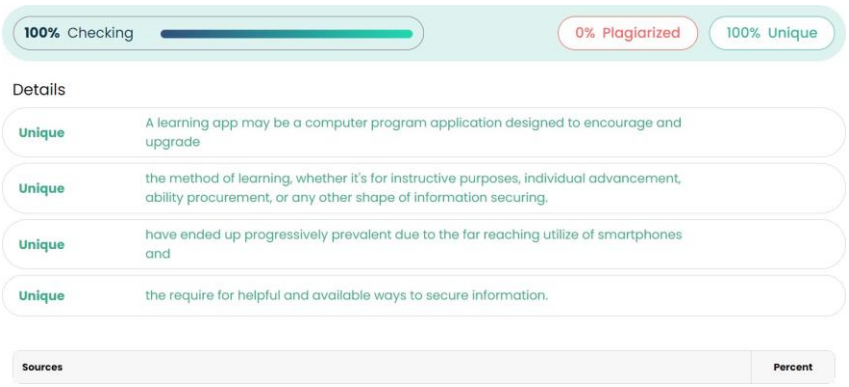

Figure 8.3: Plagiarism of Problem Statement

Sr. No.	Chapter	Unique Content
1	Abstract	100%
2	Introduction	100%
3	Problem Statement	100%

Table 8.1: Plagiarism Report

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