# Recapitulation of Lecturer's Attendance Using Android-Based Fingerprint at Dipa Makassar University

**Salman[1], Amirah[*2]**
Jl. P. Kemerdekaan Km. 9 Makassar Telp/Fax: 0411-587194/0411-587266
[1]Sistem Informasi Universitas Dipa Makassar
[2]Teknik Informatika Universitas Dipa Makassar
[1]salmanhannake@gmail.com, *[2]**amirah01.am@gmail.com**

***Abstract***

*An academic information system is expected to provide information to lecturers, students, and administrators. There are several parts included in the academic information system, including lecturer teaching schedules, lecturer attendance systems (monitoring), and student lecture schedules. These three things are related to the results of the recapitulation of lecturer attendance for reporting on the academic section institution. Dipa Makassar University, the process of recapitulating lecturer attendance still uses a manual system, namely, officers record lecturer attendance at each session and then input it into the Excel application. This process is inefficient because the work is repetitive and time-consuming. When lecturers are delayed, there is no information provided to students, causing them to wait for long periods. In this study, the researcher developed an Android-based fingerprint application for recapitulating lecturer attendance and tardiness. The testing method applied to evaluate the application is the Black Box testing method. Based on the overall testing results, it can be concluded that the application functions properly in accordance with the system requirements and is free from errors. The testing focused on the application's input, process, and output features without examining the internal structure of the program. All tested features produced valid results and met the expected outcomes. With the presence of this application, both lecturers and students can access class schedules at any time through the Android platform. Additionally, the application provides notifications to students in case the lecturer arrives late, which significantly improves communication between lecturers and students.*

***Keywords***– Recapitulation, Attendance, Tardiness, Fingerprint, Android

## 1. INTRODUCTION

The use of computer information technology is currently growing rapidly, including in the academic world. Digital transformation has become a major requirement in supporting work efficiency and improving service quality, including in academic data management, which requires a lot of time, accuracy, and resources to produce accurate information. In the context of higher education, the academic information system is a system that is expected to be a means of providing information to lecturers, students, and academic managers. Information systems assist institutions in managing information systematically, efficiently, and integrated to support the decision-making process [1]. The academic information system includes various important aspects, such as lecturer teaching schedules, student lecture schedules, and lecturer attendance monitoring systems. The presence of lecturers in lectures not only has an impact on the teaching and learning process but also becomes part of the evaluation of lecturer performance and the quality of educational services in higher education. [2]

Dipa Makassar University still uses a manual system in the process of recapitulating lecturer attendance, namely through recording on the attendance sheet of each lecture session and then inputting it regularly into the Excel application. This process is not only time and labor-

consuming, but also prone to errors and delays in reporting attendance data. Similarly, the absence of a real-time information system regarding lecturer attendance and tardiness causes students to often wait without certainty, which will have a negative impact on their learning experience. In today's digital era, such issues are a challenge that needs to be addressed through the utilization of more sophisticated technology that is responsive to information needs. Fingerprint is widely used in the world of work and education to automatically record attendance [3,4]. Android-based applications allow the presentation of information quickly and can be accessed at any time by users. Android is used as a medium for real-time notification of lecturer attendance and tardiness to students.[5]

To streamline the work of recapitulating lecturer attendance and providing information quickly to students, in this study the authors created an information system application for recapitulating lecturer attendance and tardiness using an android-based fingerprint to make it easier to recapitulate the attendance of lecturers in teaching and notifications from the android can provide information to students related to their lectures and academics can provide an assessment of lecturer performance. [6]

The problem formulation in this study is how to design an Android fingerprint-based lecturer attendance and tardiness recapitulation system application on the Dipa Makassar University campus. The purpose of this research is to design and build a system application for recapitulating the attendance and tardiness of lecturers using fingerprints and providing reminder notifications to students based on Android.[7, 8]. The purpose of this research is to design and build a system application for recapitulating lecturer attendance and tardiness using fingerprints and providing reminder notifications to Android-based students.

Several similar studies have used fingerprint technology as a tool for attendance both in schools, campuses, and industries, such as research conducted by [3, 4, 6, 10, 12, 13, 14, 16]. These studies all use fingerprint technology as an attendance tool, but in these studies each of them raises limitations when implementing the system because the fingerprint tool used is the type of fingerprint found on laptop devices, so that the storage of fingerprint results is limited. Another limitation is that it is not yet android-based which can be used as a medium for delivering information to users when and wherever they are.

As a response to these challenges, this research is motivated by the need to make a fingerprint tool with the help of an Arduino microcontroller device. This system not only records lecturer attendance automatically using fingerprint technology, but it is also able to provide real-time information to students and academic parties.[20, 21] With this system, the recapitulation of lecturer attendance becomes more efficient, accurate, and can be accessed at any time. In addition, the late notification feature through Android devices allows students to get information directly if their lecturers are late or unable to attend. This is expected to increase transparency, convenience, and effectiveness of the learning process on campus.

This research encourages the acceleration of digitalization of academic services, creates a reliable information system in supporting higher education governance, and creates a disciplined and measurable work culture among lecturers. On the other hand, this system is also a form of innovation that supports the principle of public information disclosure, where students as users of educational services have the right to obtain information related to their lecture process [19].

*Figure 1. Fingerprint*

## 2. RESEARCH METHODS

In conducting research, research planning is needed so that the research carried out can run well, systematically, and effectively. There are three general stages consisting of system analysis, system design, and system implementation [20,21]. The author designs and builds a lecturer attendance system using fingerprints to make it easier to recap the attendance of lecturers periodically, and based on Android, so that lecturer attendance information can be known by students in real time.

In this research, the research methodology used is the Waterfall method. The data used are fingerprint data, lecturer data, student data, and course data. The steps of the research method are as follows:

a. The first step in this research is Data Collection by collecting data that is needed for a lecturer attendance recapitulation system.
b. The second step is the initial data analysis, namely by identifying and classifying the types of data to be processed.
c. The third step of system design is to design the shape of a series of fingerprint devices from hardware and create an input-output design in the application.
d. The fourth step is making a fingerprint tool and an Android-based lecturer attendance recapitulation system.
e. The fifth step of system testing is to use the Black box testing method by testing the system to ensure that the system functionality is running properly

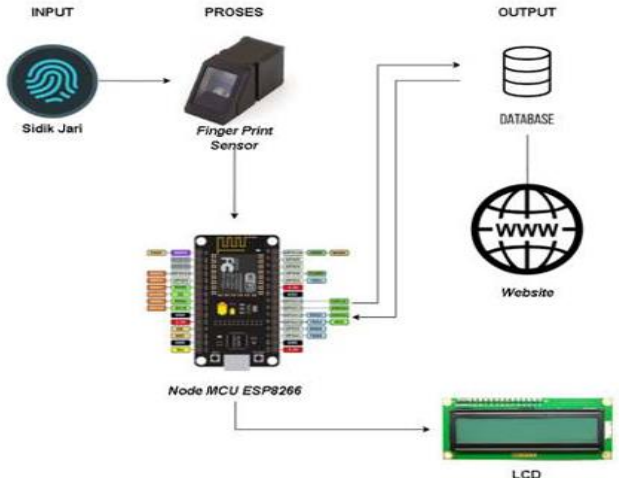



*Figure 2. Architecture of lecturer attendance recapitulation system using Android-based fingerprint*

In Figure 2, the fingerprint tool is equipped with a fingerprint sensor that functions to read the lecturer's fingerprint when scanning a finger; the results will be stored in the ESP8266 storage and also display a message on the LCD layer of the successful or unsuccessful fingerprint status. Lecturer data that has been stored in the database will be matched with the lecturer's fingerprint at the time of login.

## 3. RESULTS AND DISCUSSION

The recapitulation system for lecturer attendance and tardiness on the campus Dipa Makassar University is still very conventional, where it still uses a manual system, namely the front office officer records the lecturer's attendance at each lecture session when the lecturer enters teaching, records the entry and exit times, and then inputs them into the application excel every week or every month to see a summary of lecturers' attendance at teaching per week or per month.

This can lead to input errors resulting in incorrect reporting, which can be detrimental to lecturers, and in terms of time and energy, it is less effective because the work is done repeatedly, so it takes a long time and a lot of energy. Likewise, regarding lecturers' attendance and delays in coming to teach, there is no direct information to students, so sometimes students wait too long, and it turns out the lecturer in question is not coming.

As an alternative solution to help recapitulate lecturer attendance and provide information quickly to students if the lecturer is late or does not come to teach, a system was designed to recapitulate lecturer attendance and tardiness using an Android-based fingerprint to make it easier to recapitulate lecturer attendance and provide information to students and make it easier for academics to assess the performance of lecturers who are diligent and who are often late for teaching. The proposed system will be described in the form of a work analysis and Use Case diagram.

## System Design

The proposed system that has been created needs to be designed to make it easier to translate it into the programming language that will be used to build the system.

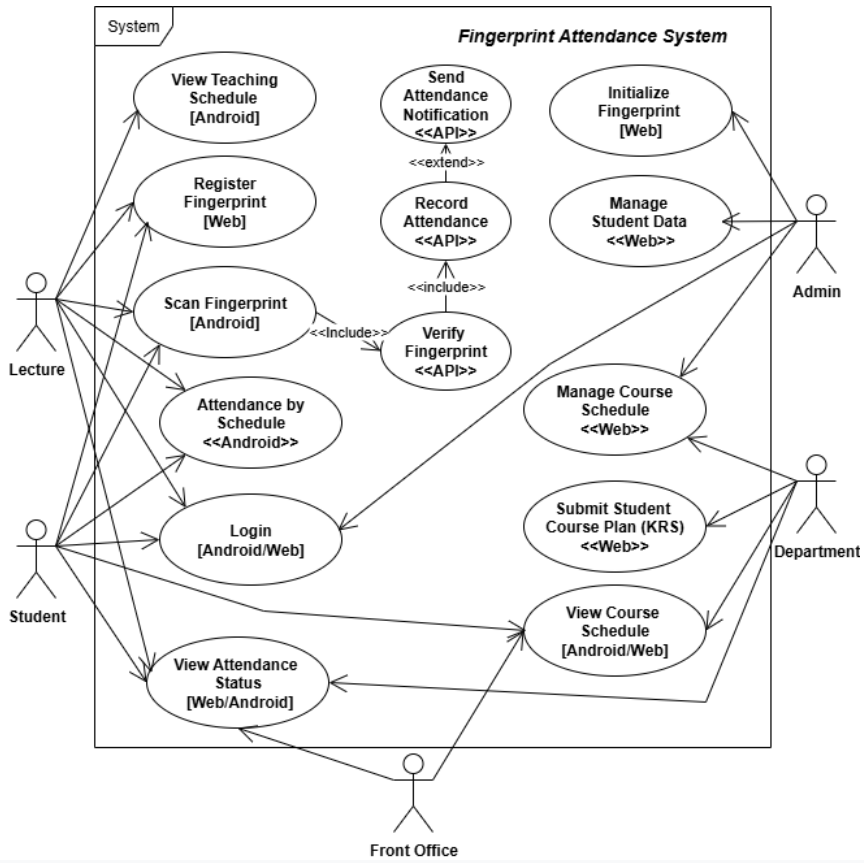



*Figure 3. Use Case diagrams*

Use case diagram in this research, as in Figure 3 actor interaction with the system to be built. Five actors have a role in this application, namely on the website, some actors can access it, namely the head of the department, front office, and admin, who all have different access, of course, according to their level, and on android there are two actors, namely students and lecturers, and on arduino only intended for lecturers for attendance. Students will get a notification on their Android if the lecturer enters. Lecturers can see their teaching schedule via Android. The department inputs the schedule of lecturers and students, the admin inputs student KRS, and the front office monitors lecturer attendance using fingers.

**Input-output Design Web Login Form**

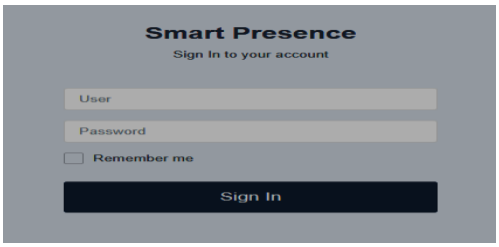



*Figure 4. Web Login Form*

Web login displays as shown in Figure 4. This menu is the initial display when opening the application. This menu is used to create a new account on the web that will be used when logging in to the Android application, according to the user level, to ensure that the user who enters is a registered user by matching the user name and password.

**Manager Data Input Form**

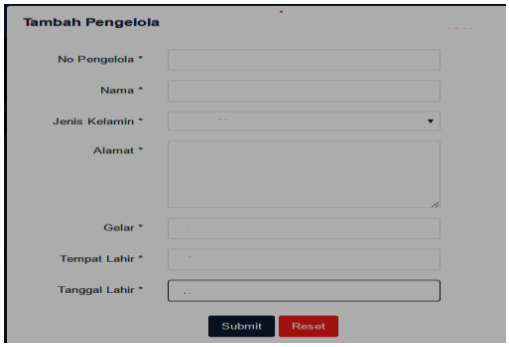



*Figure 5. Manager Data Input Form*

In Figure 5 The manager data input form in this application is used by the admin to input new manager data into the system. In this case, the manager is the Front Office, Head of Department, and BAAK who will manage data in the system.

**Lecturer data input form**

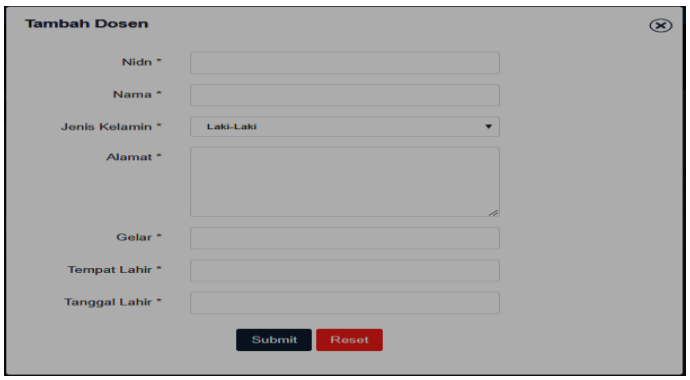



*Figure 6. Lecturer Data Input Form*

In Figure 6, this form is used to input new data for lecturers who are actively teaching on the Dipa Makassar University campus. So that when detecting fingerprints, this lecturer's data will be adjusted to the fingerprints that have been stored in the database.

**Fingerprint Input Form**

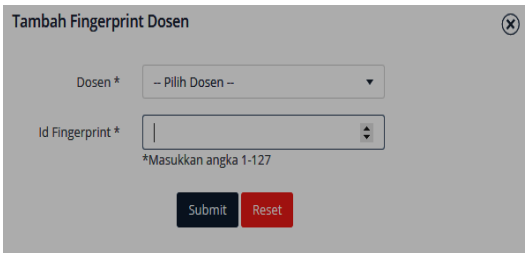



*Figure 7. Fingerprint Input Form*

Figure 7 is a form used to add fingerprints of each teaching lecturer, which will be adjusted to the previously stored lecturer data. When scanning fingerprints, there is a fingerprint id that must be given to each lecturer as a unique code that distinguishes the fingerprint identity of each lecturer so as to avoid fingerprint forgery.

**View the fingerprint display**

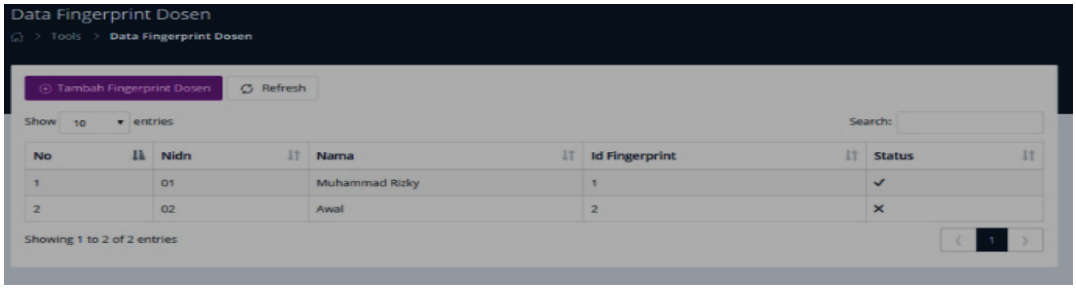



*Figure 8. View the fingerprint display*

Figure 8 is a list of lecturer fingerprint results displayed. This display is used to view a list of all lecturers on campus who have registered fingerprints.

**Student Data Input Form**

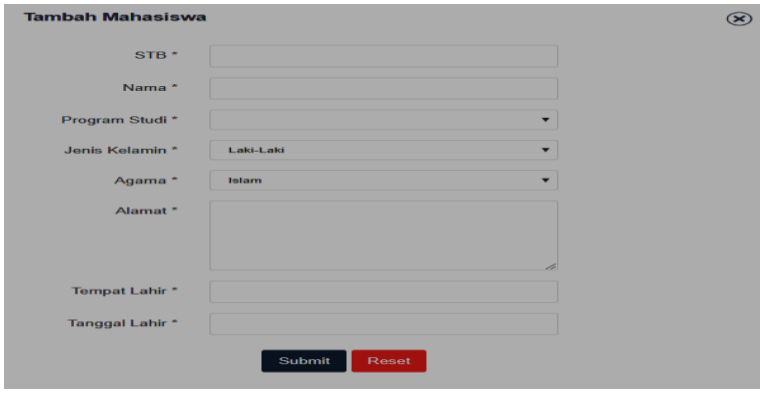



*Figure 9. Student Data Input Form*

Figure 9 is a menu form that is used to input new student data, which will be connected to lecturers based on courses taken in the current semester.

**Course Data Input Form**

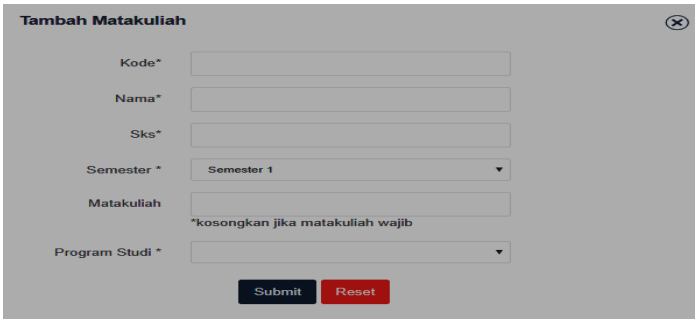



*Figure 10. Course Data Input Form*

Figure 10 is a form used to input new data for all courses that will be programmed by students during the lecture period.

**KRS Data Input Form**


*Figure 11. KRS Data Input Form*

Figure 11 is a menu form that is used to input courses that will be programmed by students in the current semester.

**KRS Data View Display**

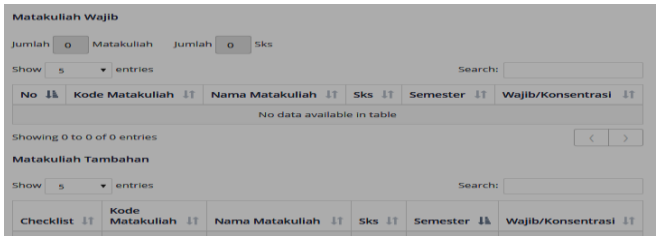



*Figure 12. KRS Data View Display*

In Figure 12, we can see the data that we have previously input, and there is also a search menu to find data more quickly if there is already a lot of data.

**View Course Schedule**

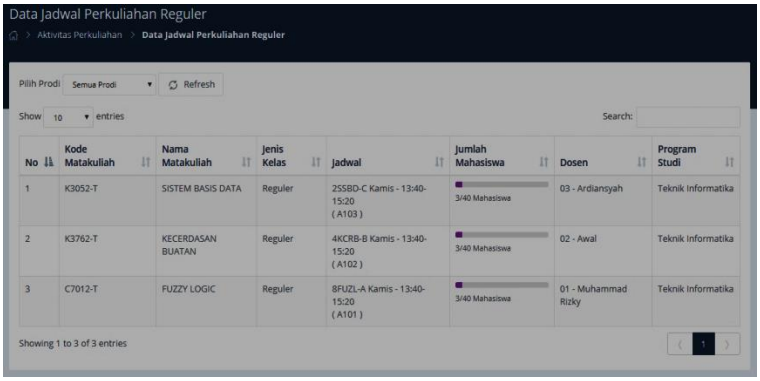



*Figure 13. View Course Schedule*

Figure 13 is a display of lecture schedules in the current semester. Students can see the lecture schedule along with the lecturer teaching the course, while the lecturer can see the teaching schedule.

**Lecturer Attendance Recap View**


*Figure 14 Lecturer Attendance Recap View*

Figure 14 is a recap view of lecturer attendance that has been input periodically. The only parts that can see this recap menu are the monitoring section, BAAK, and the department, so that the department can assess the performance of each lecturer.

**Android Login Menu**


*Figure 15. Android Login Menu*

Figure 15 is the login page menu on the Android application. This menu can only be accessed by lecturers and students who have registered in the application by logging in according to the username and password that have been input into the system.

**Android Main Menu Display**

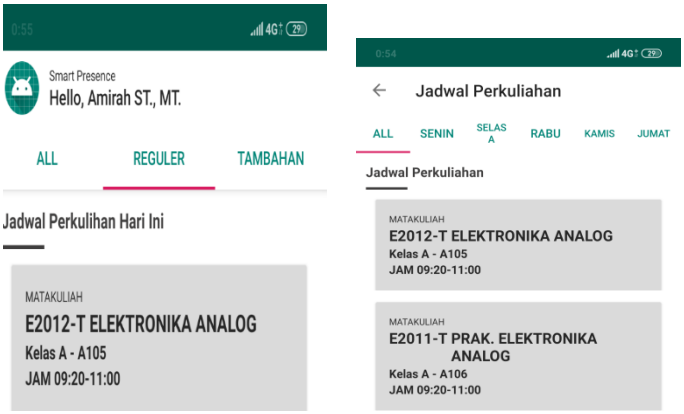



*Figure 16. Android Main Menu*

Figure 16 is the main menu display on Android, intended for lecturers and students who have logged in on the previous login menu according to the user name used. This menu will display the identity of the user who has logged in, along with the lecture schedule, complete with the name of the course, class, and time.

**System Testing**

System testing is carried out using a direct testing method based on the Black Box technique by testing the functionality of the application, buttons, and the suitability of the application results.

**Web Login Testing**

*Table 1. Web Login Testing*

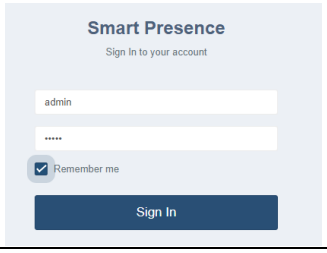
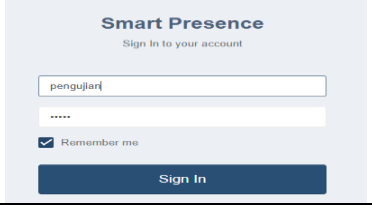
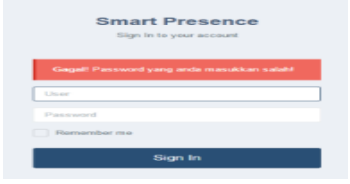
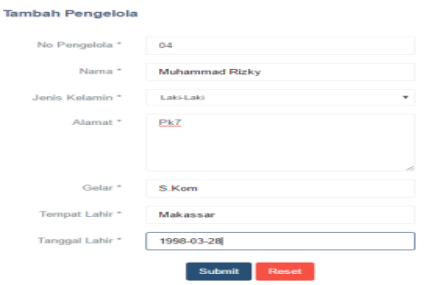
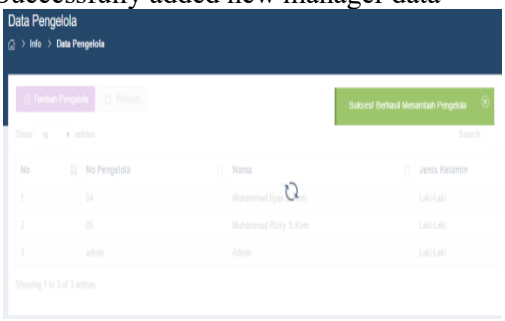
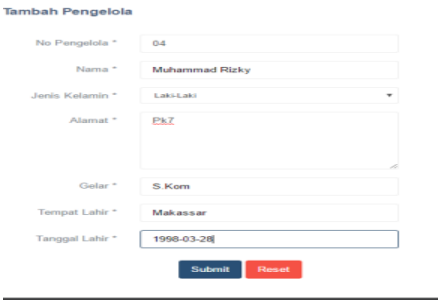
| Testing Scenarios | Expected results |
|---|---|
| Enter the correct User and Password   | Successfully Entered the Main Menu of the web application  |
| Entering the Wrong User and Password   | Successfully displays an error message and cannot enter the dashboard   |

Table 1 above shows that when the actor enters the correct user and password, he will go to the main page, namely the dashboard page, and when he enters the wrong user and password, an error message will appear.

**Academic Manager Data Input Testing**

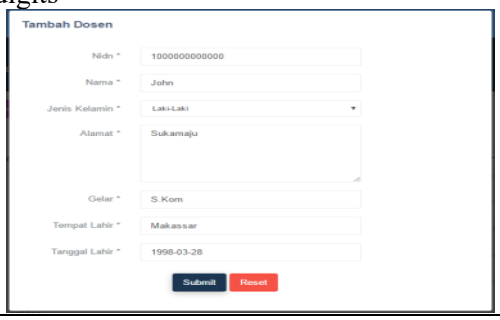
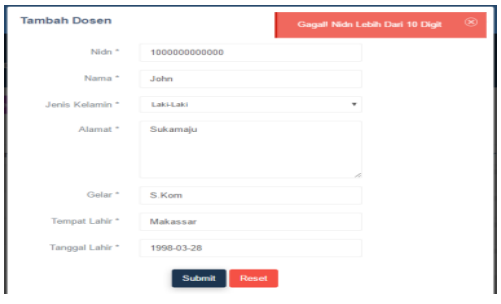
*Table 2. Academic Manager Data Input Testing*

| Testing Scenarios | Expected results |
|---|---|
| Entering management data that has not been registered previously   | Successfully added new manager data   |
| Enter the registered management data   | Successfully Displays an Error Message that the Management Number has been registered   |

In the table 2 above, where the manager data input is tested by inputting all the required data then pressing submit, the data will be saved to the database. To ensure that the data has been saved, you can look at the Data Manager menu. If the data is the same, an error message will be displayed.

**Testing Lecturer Data Input**

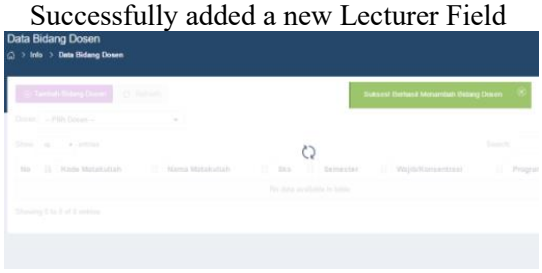
*Table 3. Testing Lecturer Data Input*

| Testing Scenarios | Expected results |
|---|---|
| Enter the Lecturer's Nidn more than ten digits   | Successfully Shows Error Message that Nidn is more than ten   |

In table 3, test the Lecturer's data input by entering all the data then press submit so that the data will be saved to the database, if nidn is more than 10 then an error message will appear.

**Lecturer Field Input Testing**

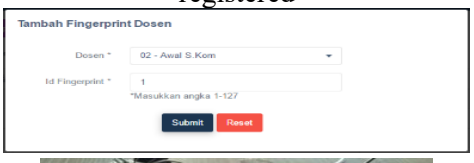
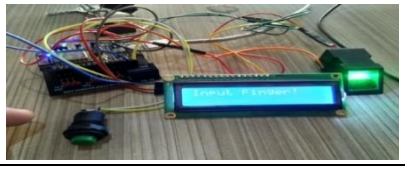
*Table 4. Lecturer Field Input Testing*

| Testing Scenarios | Expected results |
|---|---|
| Enter a new Lecturer Field   | Successfully added a new Lecturer Field   |

In table 4, enter all lecturer field data, then press submit, the data will be saved to the database, the data that has been saved can be seen in the Lecturer Field Data menu.

**Fingerprint Input Testing**

*Table 5. Fingerprint Input Testing*

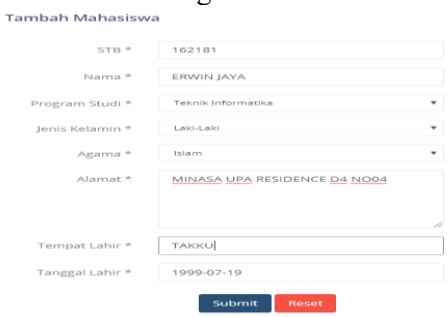
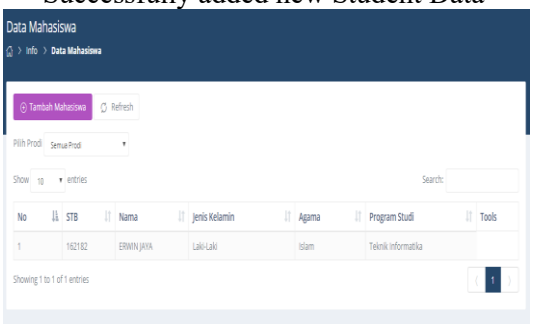
| Testing Scenarios | Expected results |
|---|---|
| Input fingerprint data that has not been registered    | Successfully added new Fingerprint Data   |
| input the registered Fingerprint data   | Successfully Displays Error Message Fingerprint has been registered   |

In Table 5, test the Fingerprint data input by entering fingerprint data then press submit, the data will be saved to the database, then input the fingerprint from Arduino according to the ID that has been entered.

**Testing Student Data Input**

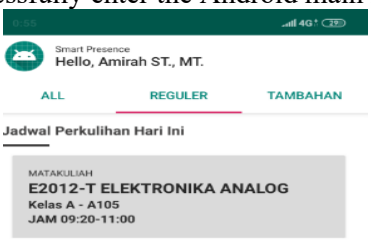
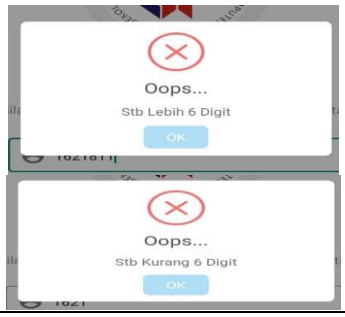
*Table 6. Testing Student Data Input*

| Testing Scenarios | Expected results |
|---|---|

| | |
|---|---|
| Input data for students who are not yet registered<br>  | Successfully added new Student Data<br>  |

**Android Login Testing**

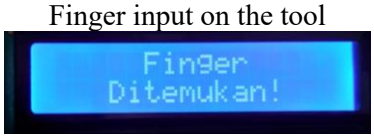
*Table 7. Android Login Testing*

| Testing Scenarios | Expected results |
|---|---|
| Input the registered User and Password<br>.<br>  | Successfully enter the Android main menu<br>  |
| Entering the wrong User and Password<br>  | Successfully Displays Error Message and cannot enter main menu<br>  |

In Table 10, the Android login test above shows that when the actor enters the correct user and password, he will enter the Android main page, and if it is incorrect, an error message will appear, and he cannot enter the main menu.

**Android Notification Testing**

*Table 8. Android Notification Testing*

| Testing Scenarios | Expected results |
|---|---|
| Finger input on the tool<br>  | Successfully displays notifications to Android app<br>  |



In testing the application function using the black box testing technique, it can be concluded that the overall test results of the application created are in accordance with the desired specifications, and this application works well from the input process to the output in the form of Notifications and Recaps of lecturer attendance, so that this test is successful and free from system errors.

The weaknesses obtained from this system lie in the workability of the fingerprint reader, the reading process is slow, and the fingerprint sensor can also sometimes not read fingerprints accurately if the finger is dirty, wet, or injured. This can cause reading failures and hinder the attendance process.

## 4. CONCLUSION

1. With this application, it will be easier for monitoring parties to recapitulate lecturers' attendance and tardiness, and lecturers can see their teaching schedule at any time via Android.
2. Students can find out whether their lecturer is coming in that day or not by the notification the student receives via the Android application.
3. The weaknesses obtained from this system lie in the workability of the fingerprint reader; the reading process is slow, and the fingerprint sensor can also sometimes not read fingerprints accurately if the finger is dirty, wet, or injured. This can cause reading failures and hinder the attendance process.
4. Suggestions for further research are the selection of fingerprint sensors that are more sensitive so that the fingerprint reading process is faster, and this system should also be expanded so that it can be integrated with the teaching honorarium payroll system based on lecturer attendance.

## 5. ACKNOWLEDGMENTS

The author feels very grateful and would like to thank Allah SWT for all His grace and mercy, which gave the author the motivation and strength to complete the writing of this scientific work. On this occasion, the author would like to express his sincere and infinite gratitude to all parties who have provided valuable guidance, input, suggestions, thoughts, and support during the writing of this scientific work. Very big thanks to all who have made valuable contributions in writing this work, to colleagues who have provided a lot of input and suggestions to the author.

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