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DESIGN OF THE ATTENDANCE SYSTEM USING WEB-BASED GPS

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Abstract: The design of an attendance system utilizing web-based Global Positioning System (GPS) technology represents a forward-looking solution in the landscape of workforce management. This innovative system leverages the capabilities of GPS to enhance accuracy, efficiency, and accessibility in tracking employee attendance. Traditional attendance systems often face challenges related to precision and real-time data capture, prompting the need for a more dynamic and reliable approach.In an era of technological evolution, organizations are compelled to adopt innovative solutions that streamline their operations. This web-based GPS attendance system not only offers a contemporary approach to attendance tracking but also lays the foundation for future enhancements and adaptations. The forthcoming exploration of the system's design will provide a detailed understanding of its features, functionalities, and the value it brings to organizations seeking a reliable and efficient attendance management solution.

INTRODUCTION

The integration of web-based Global Positioning System (GPS) technology into attendance systems marks a significant leap forward in the realm of workforce management. This innovative approach leverages the power of GPS to enhance the precision, efficiency, and accessibility of attendance tracking. Traditional attendance systems often grapple with challenges related to accuracy and real-time data capture. The utilization of web-based GPS aims to overcome these challenges by providing a dynamic solution that ensures reliable attendance records and simplifies the overall attendance management process.

This design introduces a comprehensive attendance system that harnesses the capabilities of web-based GPS technology(1). The system is meticulously crafted to cater to the diverse needs of organizations seeking an advanced and user-friendly tool for monitoring employee attendance. The following sections will delve into the various components of the system, including login interfaces, attendance entry

functionalities, employee data management, and attendance report generation. The design focuses on optimizing user experience, ensuring seamless integration, and addressing potential challenges associated with attendance management(2).

As technology continues to evolve, organizations are compelled to adopt innovative solutions that streamline their operations. This web-based GPS attendance system not only offers a contemporary approach to attendance tracking but also sets the stage for future enhancements and adaptations. The ensuing exploration of the system's design will provide a detailed understanding of its features, functionalities, and the value it brings to organizations seeking a reliable and efficient attendance management solution.

RESEARCH METHODS

1. Information System

System is a collection of interconnected elements that interact to achieve a specific goal. In a more specific context, a system can refer to a set of software and hardware components that work together to provide a particular function or service(3). For example, in the context of the "attendance system" described earlier, the system includes software and hardware used to track and manage employee attendance at the Besilam Bukit Lembasa Village office. This system may encompass elements such as a web-based platform, GPS technology, a central database, user interfaces, and automation components. The entire system works together to achieve specific goals, such as improving efficiency and transparency in employee attendance management.

An information system is a system designed to collect, manage, store, process, and provide information that is useful to users(4). This system consists of various components, including hardware, software, databases, communication networks, and people who interact with the system.

The main purpose of an information system is to assist organizations or individuals in making better decisions by providing access to relevant and accurate information. Information systems can be used in various contexts, including business, government, education, health, and more(5).

Examples of information systems include database management systems, management information systems, geographic information systems, and many

others. Information systems can also focus on various fields, such as finance, human resources, sales, production, and so on.

2. Global Positioning System (GPS)

The Global Positioning System (GPS) is a technological marvel that has transformed the way we navigate and understand our position on Earth. Developed and maintained by the U.S. Department of Defense, GPS is a satellite-based navigation system comprising a constellation of satellites orbiting the Earth(6). These satellites continuously emit signals containing precise timing and positional information.

GPS receivers, commonly integrated into devices like smartphones and car navigation systems, receive signals from multiple satellites. By triangulating these signals, the receiver calculates the user's exact geographical coordinates, including latitude, longitude, and often altitude(7). The accuracy of GPS is remarkable, typically providing location data within a few meters.

The system operates through three key segments: the space segment (satellites), the control segment (ground control stations), and the user segment (GPS receivers). With a global constellation of satellites distributed across multiple orbital planes, GPS ensures comprehensive coverage around the world.

As technology advances, so does GPS. The latest generation, GPS III, introduces improvements in accuracy, signal strength, and resistance to interference(8). Augmentation systems like WAAS and EGNOS enhance GPS accuracy further, making it an invaluable tool across various industries and daily life. In essence, GPS has not only reshaped how we navigate but has become an integral part of our interconnected, location-aware world(9).

3. Website

The Web, short for the "World Wide Web," is a global digital ecosystem that enables access and exchange of information through the internet network. By using a web browser, users can explore various documents, text, images, videos, and other multimedia content stored on servers worldwide(10). The Web is based on the primary communication protocol known as HTTP (Hypertext Transfer Protocol) and uses the HTML (Hypertext Markup Language) markup language to compose and format documents. Through hyperlinks(11), users can easily navigate from one web page to another, forming a structured network of information. Websites, as

collections of related pages, serve as containers for conveying information, providing services, or facilitating online interactions. Responsive web design ensures optimal access from various devices, while interactive elements such as online forms and animations add a dynamic dimension to user engagement. The Web is not only a means of publication and information access but also a platform supporting global communication, e-commerce, and various online activities. As the core of modern digital life, the Web continues to evolve, creating increasingly sophisticated and interconnected user experiences(12).

A website is a page or series of pages that can be accessed through the internet and presents specific information or content. Each website has a unique URL (Uniform Resource Locator)(13), allowing users to access it using a web browser. Websites can include various types of content, such as text, images, videos, online forms, and other interactive elements. The design and structure of a website can vary depending on the goals and needs of the users. Business websites may be designed to promote products or services, while news websites provide current information and the latest news. Websites can also serve as platforms for user interaction, such as forums or social networks. The success of a website often depends on effective navigation, responsive design for various devices, and the clear and engaging presentation of information. With the continuous advancement of web technology, websites have become essential tools for communication, information dissemination, and interaction in the current digital era.

RESULTS AND DISCUSSION

Here is the Unified Modeling Language (UML) design for the "Design of Employee Attendance System for the Besilam Bukit Lembasa Village Office in the Wampu Sub-district Using Web-Based GPS":

1. Use Case Diagram: shows the main functions of the attendance system, such as login, incoming attendance, outgoing attendance, and display of attendance data.
2. Activity Diagram: illustrates the workflow of the attendance system, from the use of GPS to determine attendance location to the processing of attendance data by the system.

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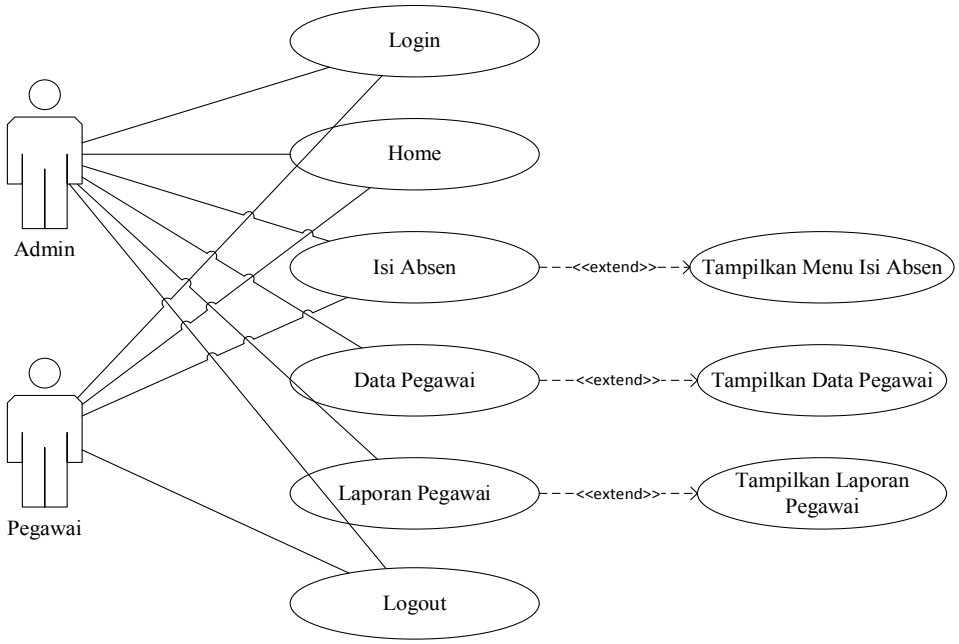
3. Sequence Diagram: shows the sequence of activities that occur in the attendance process, from the use of GPS to the storage of attendance data.
4. Class Diagram: depicts the classes within the attendance system, such as Employee, Attendance, GPS, and Website.

By employing UML, researchers can create a design for the attendance system that is more easily understood and implemented by the development team. UML design can also assist in identifying system requirements and addressing potential issues before development takes place.

1. Use Case Diagram

The use case diagram in this research has levels as admin and employee. Figure 1 is a use case diagram for designing an attendance system.



Gambar 1. *Use case diagram*

2. *Activity Diagram*

The activity diagram in the attendance system serves the purpose of detailing the workflow for both administrators and employees. This activity diagram is utilized to illustrate the activities or actions within the attendance system, such as fetching data from GPS, login validation, and attendance data processing. The Activity Diagram also depicts login branching within the system. Figure 2 illustrates the activity diagram of the designed system.

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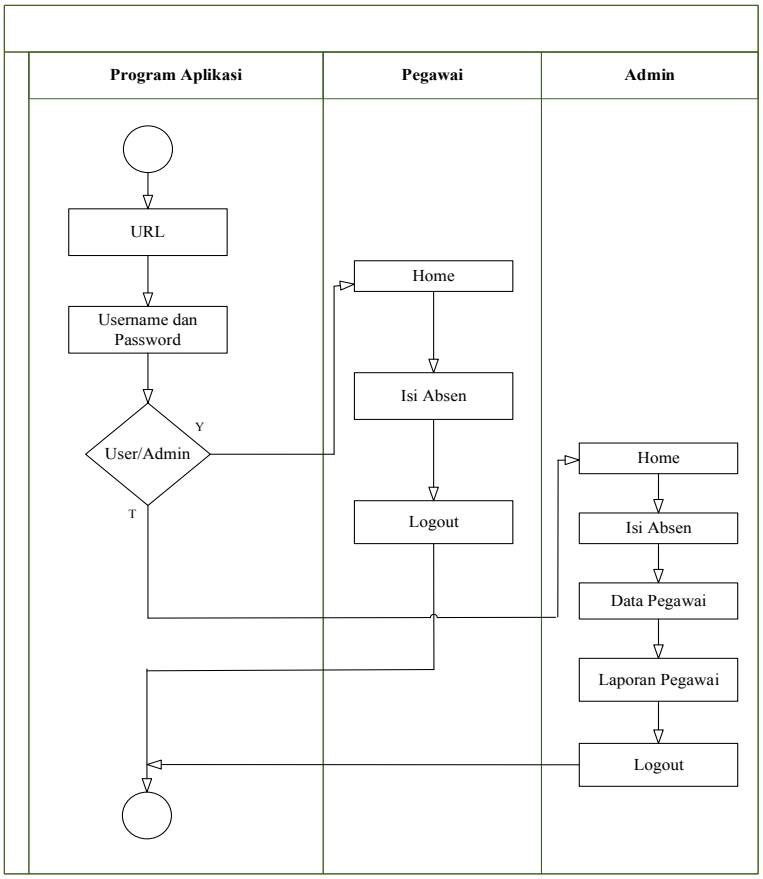

Gambar 2. *Activity diagram*

3. *Sequence Diagram*

The sequence diagram in this system serves the purpose of illustrating the interaction sequence between the admin and employees in the attendance system. The sequence diagram can provide a clear overview of how administrators and employees perform their functions in the attendance system.

The sequence diagram is used to depict the sequence of tasks performed by each menu in the attendance system. In the "Design of Employee Attendance System for the Besilam Bukit Lembasa Village Office in the Wampu Sub-district Using Web-Based GPS," the sequence diagram can be employed to illustrate how attendance data is retrieved from GPS, how login is executed, and how attendance data is processed and stored in the system. Figure 3 represents the sequence diagram for the admin section, and Figure 4 is the sequence diagram for the employee section of the attendance system.

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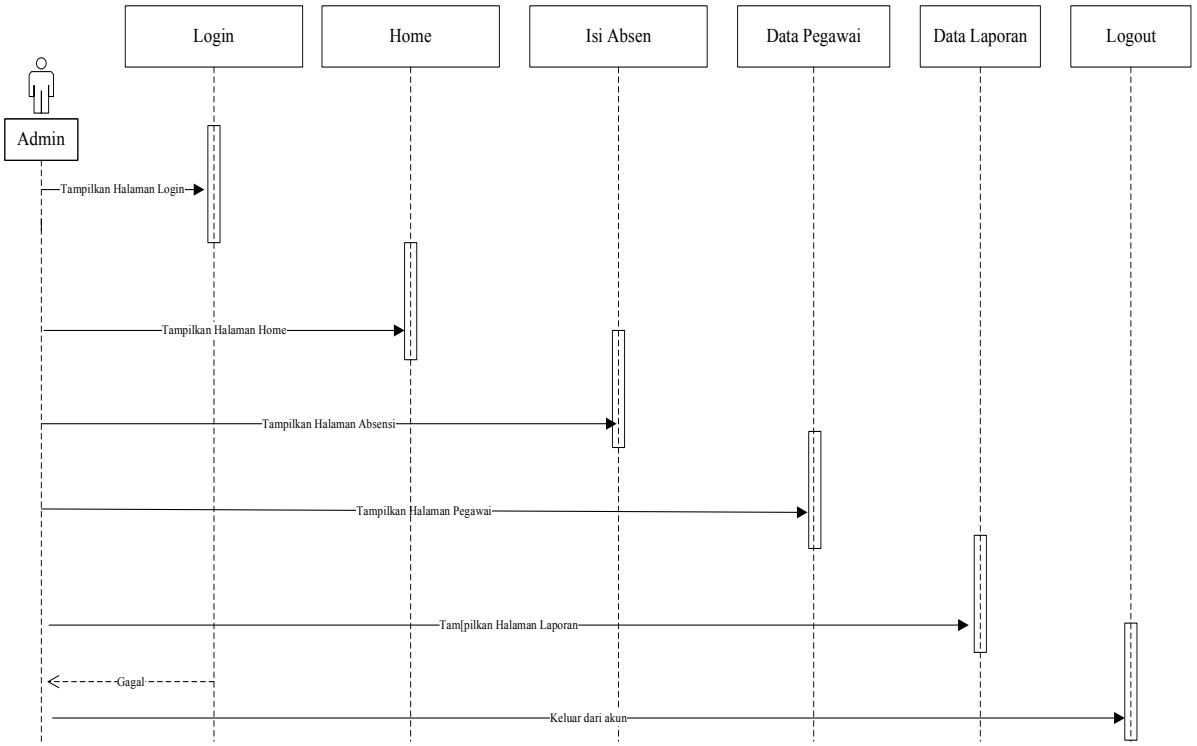
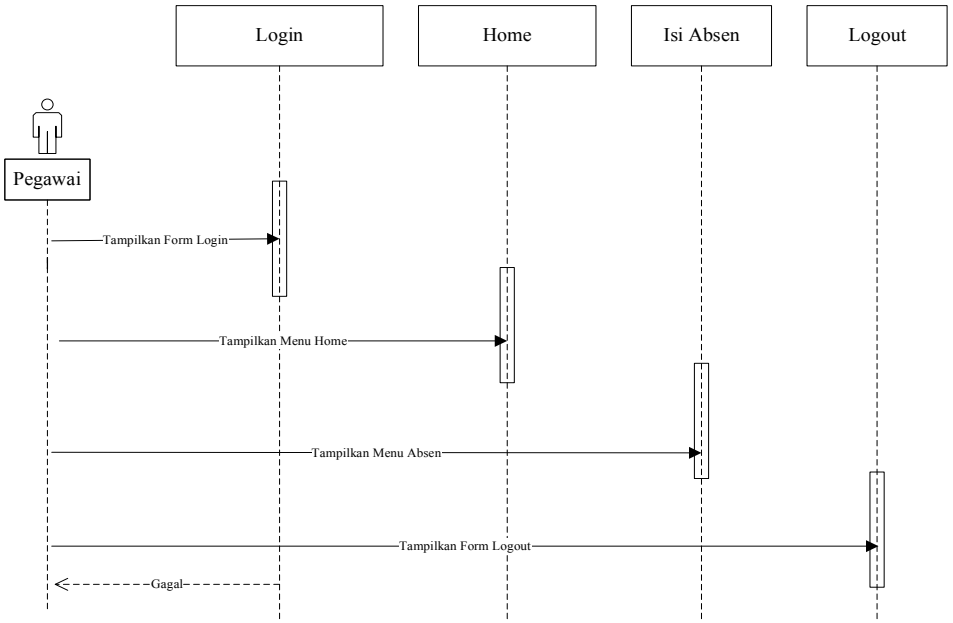


Gambar 3. *Sequence diagram* admin



Gambar 4. *Sequence diagram* employe

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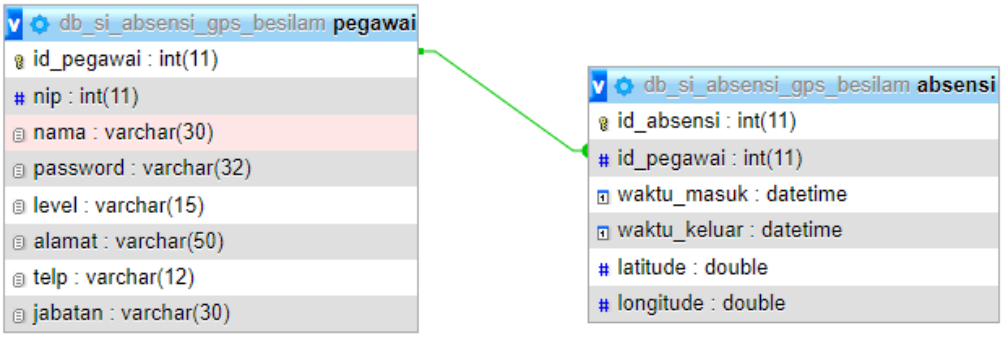
4. Class Diagram

The class diagram in this system serves the purpose of illustrating the classes and relationships between classes in the attendance system. The class diagram is used to depict the attributes, operations, and relationships between classes in the attendance system.

The class diagram can be used to illustrate classes in the attendance system such as the GPS class, employee class, attendance class, and admin class. The class diagram in the attendance system allows admin or employee users to record attendance only once, for both check-in and check-out, each day. Figure 5 represents the design of the class diagram for the attendance system.



Gambar 5. *Class diagram*

The results and discussions presented in this chapter are expected to provide a clear overview of the performance and effectiveness of the designed and implemented system, serving as a reference for future system improvements. Additionally, this chapter also discusses the findings and issues that arose during implementation, along with the solutions adopted to address these problems.

5. Login and Home Menu Display

The login interface in this attendance system is designed with a simple and user-friendly layout for easy understanding by users. On the login page, there is a login form consisting of fields to enter a username and password. Figure 6a displays the login menu interface. The home view in the constructed system is designed with a simple and user-friendly layout to ensure users can easily comprehend and operate the application's features.

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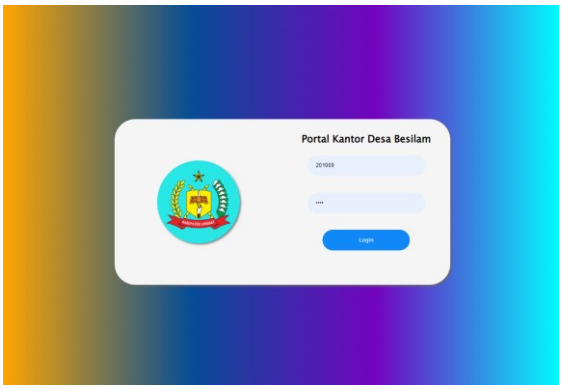
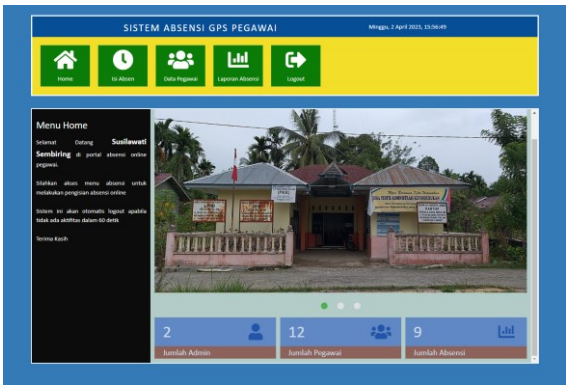
On the home page, users can see the available main menus, such as Attendance Entry, Employee Data, and Attendance Data. Additionally, the home page provides information about the number of employees who have attended today and the number of employees who have not attended on that day. Figure 6b shows the home menu interface.



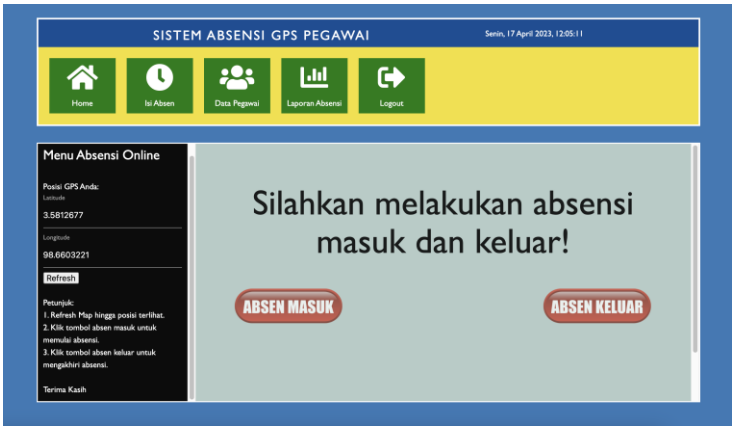
Gambar 6a. Login Home Display



Gambar 6b. Home menu display

6. Display the Absence Contents Menu

The attendance entry interface in this system comprises several essential components. Firstly, there is an option to refresh the GPS position. Furthermore, in the attendance entry view, there are buttons to check in and check out. The attendance time is automatically recorded by fetching the current computer clock time. Figure 7 displays the attendance entry menu interface.

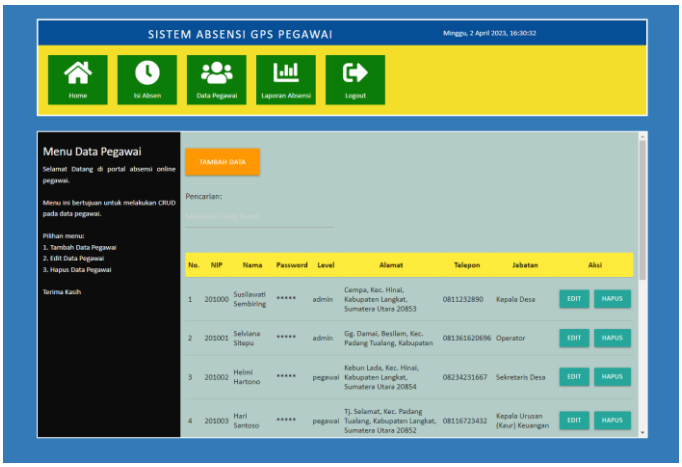


Gambar 7. Display the Absence Contents Menu

7. Employee Data Menu Display

The employee data interface in this system displays employee data in a table consisting of several columns, such as employee name, position, employee ID, and phone number. Users can search for employee data based on the employee's name or

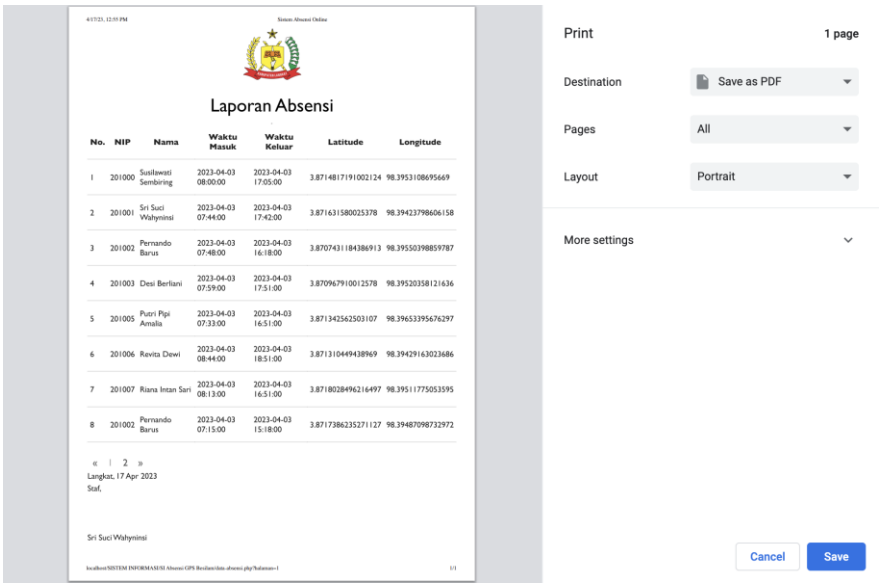
employee ID. Additionally, there are buttons to add new employee data, edit existing employee data, and delete employee data. The employee data view is designed to facilitate users in managing employee data quickly and efficiently. Figure 8 shows the employee data menu interface.



Gambar 8. Employee Data Menu Display

8. Print Attendance Report Menu Display

The attendance report printing interface is a menu displaying the list of all employees who have attended in the information system. This report can be saved as a PDF file and can also be directly printed to a printer. Figure 9 shows the interface result of the attendance report printing menu.



Gambar 9. Print Attendance Report Menu Display

CONCLUSION

In conclusion, the design of the attendance system utilizing web-based GPS technology represents a significant advancement in tracking and managing employee attendance. The incorporation of GPS enhances the accuracy and reliability of attendance data, providing a more robust solution for organizations. The user interfaces, including login, attendance entry, employee data management, and attendance report printing, have been crafted to be user-friendly and efficient. The system's capability to automatically capture GPS data and timestamp attendance entries streamlines the overall process.

Overall, the design of this web-based GPS attendance system demonstrates a commitment to leveraging technology for improved attendance tracking and management, offering a reliable and user-friendly solution for organizations seeking a modern and efficient approach to workforce attendance **monitoring.**

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