System Design of Course Scheduling of Telecommunication Engineering Majors at Politeknik Negeri Semarang

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Abstract— Telecommunication Engineering is one of Study Program (Prodi) at State Polytechnic of Semarang (Polines). The development of information technology (IT) can provide ease to meet various information needs. Course schedule used as a reference for teaching and learning activities to fit the target. In Prodi Telecommunication Engineering Polines to create a schedule still using Microsoft Excel applications as well as in publications on lecturers and students are still using physical mading. With that background then the authors make the information system scheduling courses. This information system is created using the PHP programming language utilizing the Laravel framework and MySQL database. After the system is completed the test is done by using the black box method to prove all the features work well in accordance with their respective functions. Design model using modeling Use Case Diagram and Entity Relationship Diagram (ERD) can be done to design Scheduling System Subject Telecommunication Engineering Program Polines. This application is made in the form of websites and integrated with the database, so it can be accessed by the user in realtime on the Intranet network. Schedule preparation courses can be done Kaprodi using web-based information system. The results of this information system can be used to create course schedules and can be accessed so that lecturers and students can view the course schedule

Index Terms— Polines, telecommunication, black box, Laravel, scheduling, courses

I. PRELIMINARY

The application of information and communication technology should be applied thoroughly in the education world. State Polytechnic of Semarang (Polines) is one of the higher education institutions that apply vocational education, while Telecommunication Engineering is one of Study Program (Prodi) in Polines. In conducting teaching and learning activities, Telecommunication Engineering Study Program divides the type of lectures into two main parts, namely theory and practice. The availability of confined space causes the distribution of lecture rooms to prioritize the laboratory space for practice materials while theoretical material can be done in any classroom. So that the application of information technology to facilitate the division of classroom priority and teaching time of lecturers into special consideration so that the lecture process can run systematically embodied in lecture schedule. And can replace mading as a publication media course schedule. Currently the preparation of lecture schedules in Prodi Engineering Telecommunications still use Microsoft Excel so it does not keep up with the times. The preparation of lecture schedules using this application if there is a double schedule then the text will show the red color on the element of the same schedule. Such as the lecturers who have been teaching at the same time in different classes and elements of the room that has been used. But to investigate the same elements are required to find manually in the table can take a lot of time, so it will interfere with the efficiency of the work of the

Problems

Chairman of the Study Program (Kaprodi).

Based on existing problems, scheduling information system of Telkom Polines Engineering Study Program is an alternative to replace the existing system. In addition to following the development of increasingly advanced technology, according to Muttaqin (2011) the need for information systems can maximize the process of teaching and learning activities that create order and order in the learning process. In this final project is designed Scheduling System of Telecommunication Engineering Study Program Telkom Semarang, so it is expected that the process of preparation of lecture schedule can be done by Kaprodi and the publication process easier to do.

Purposes
1. Designing Scheduling System of Telecommunication Engineering Study Program.
2. Establishment of Scheduling System The subjects of Telecommunication Engineering Study Program utilize Laravel framework.

II. THEORY

Information Systems

Understanding information systems can be explained by interpreting the two words contained the system and information. According to the Agency for Language Development and Development (2016) the system is a tool of elements, methods, arrangements that are regularly interconnected to form a totality and information interpreted as an information, notification, news or news about a whole meaning supporting the mandate seen in the the mandates. Another sense of the system is defined as a set of components that interact and work together to achieve certain goals and information is the result of data processing into something meaningful and valuable for decision making (Bonnie and Marion, 2008). Then the understanding of information systems by Subari (2004) is a system within the organization that reconcile the needs of daily transaction processing that support the function of organizational operations that are managerial with the strategic activities of an organization to be able to provide to certain outside parties with the necessary reports.

While the definition of information systems according to Kadir (2014) is a coverage of a number of components in the form of human, computer, information technology, and work procedures and there is something that is processed into data into information and intended to achieve a goal or goal. Thus, it can be concluded that the information system is a series of human components, procedures, data and technology such as computers used to perform a process systematically to produce valuable information for decision making.

Academic Schedule

Understanding the schedule according to the Agency for Development and Development of Language (2016) is the division of time based on the plan arrangement of work order, list or activity table or activity plan with a detailed time division of implementation. Academic schedule is the information about the schedule of lecture activities organized by an educational institution in this case is the State Polytechnic Semarang made to expedite the process of lectures. So that lectures run regularly and systematically and in teaching and learning activities there are definite goals and targets to be achieved.

Database

Database can be interpreted a way of documenting various data which then managed with a system then stored in a storage media (Nugroho, 2005). The database according to Kadir and Triwahyuni (2005) is an organization of data sets that are inter-related so as to facilitate the activity of obtaining information. Meanwhile, according to Utami (2008) database is a set of data that is arranged logically and controlled centrally. Thus the data can

be accessed easily and quickly. Storage media can be storage storage such as hard drives. The data in the existing database is not only diletakkkan and stored in a storage media, but managed by a database management system that is often called the Database Management System (DBMS). DBMS is software designed to be able to utilize and manage large amounts of data collection (Utami, 2008). That way a data with large and complex numbers can be very well arranged to allow easy and fast accessing of data by users. The description of the relationship between the database and the access can be seen in Figure 2
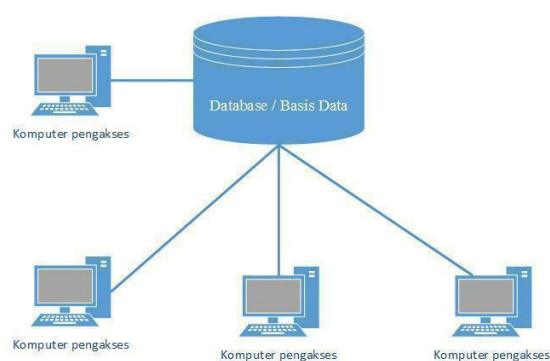

Figure 1 Depiction of Database with Accessors
(Nugroho, 2005)

The use of data base is very important in making the information system due to relational database is often called the Relational Database Management System (RDBMS) is used to manage the data stored by maximizing the authentication data so that it can be used as information by the information system created so that if not then the data in storage will experience many problems until it can not be accessed (Nugroho, 2005).

Data Chart

The diagram model used as the design design of the system is Unified Modeling Language (UML). UML is a "language" that has become the industry standard for visualizing, designing and documenting software systems. UML offers a standard for designing a system model. Using UML can create a model for all types of software applications so that the application can run on any hardware, operating system and network, and written in any programming language (Sri Dharwiyanti, 2003).

The modeling used is Use Case Diagram and Entity Relationsh ip Diagram (ERD). Use Case Diagram is a diagram that describes the expected functionality of a system that represents an interaction between actors with the system, whereas ERD is a modeling diagram showing relationships or relationships between tables that form the database system so that the system can function properly. There are two main components in this model: entities and attributes. The notions of entities and attributes are explained by Khan (2016) that Entities are objects or objects in the real world

that can be distinguished from other objects. Entities may be considered real, such as a book or a person or may be abstract, such as loans, vacations or concepts. Entities in the database system actually represent a table. While the content of an entity is called an attribute that is often mentioned as a column or field. For example, someone has an attribute person_id, name, occupation, salary. A book has the attribute of book_id, author, publisher, category, number of copies. Each table can utilize the contents of the table attributes used as a reference to be more efficient in the use of tables by relating the table.

Laravel

Laravel is a PHP-based free framework of the most popular so widely used by many programmers (Nutile, 2016). Laravel supports the basic concept of Object Oriented Programing (OOP), each of the latest PHP releases using the same concept (Triyono, 2016). Laravel is an opensource framework that has many powerful features that can speed up website development. Key features provided are Modularity, Testability, Routing, Configuration management, Query builder and ORM (Object Relational Mapper), Schema builder, migrations and seeding, Template engine, E-mailing, Authentication, Redis, Queues, Event and command bus (TechInputs , 2017).

Based on idcloudhost.com (2016) Laravel is a PHP framework released under the MIT license, built with the concept of MVC (view controller model).

Laravel is an MVC-based website development written in PHP designed to improve software quality by reducing initial development costs and maintenance costs, and to improve work experience with applications by providing expressive, clear and time-saving syntax.

MVC is a software approach that separates application logic from presentation. MVC separates applications based on application components, such as data manipulation (Model), Controller, and user interface (View).
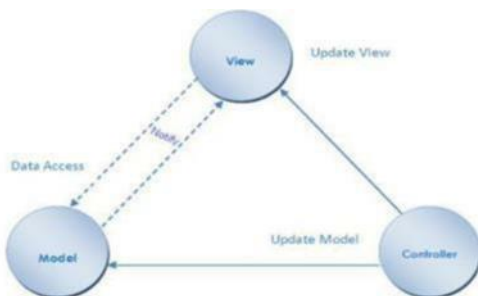

Figure 2 Diagram of the MVC Concept (Landicho, 2016)

III.   DESIGNING

System Overview

In general, the system created in the final task of "Design of Scheduling System of Telecommunication Engineering Study Program Telkom" is described in Figure 3 below.
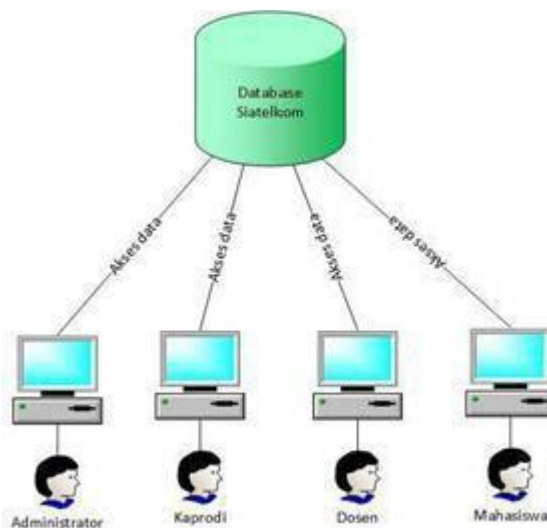

Figure 3 System Architecture

In Figure 3 it is explained that the system is created and stored in the database named "siatelkom" which accommodates three systems, namely the scheduling system of the course, the final task monitoring system and the apprenticeship monitoring system in the Telecommunication Study Program. Course scheduling system can be accessed by four user level ie administrator, kaprodi, lecturer and student. Each user has different permissions to match the authority of each user based on the applicable terms. An administrator has the right to manage all data residing on the system. Kaprodi has the right to arrange the course schedule and access the course schedule. A lecturer and student have only the right to access the course schedule.

Use Case Diagram

Use case diagram to show the relationship of users with the system on the scheduling system of Telecommunications Engineering Study Program is shown in Figure 4 as follows.

Figure 4 Use Case Diagram Scheduling System Subject

Entity Relationship Diagram (ERD)

ERD to show relationships between tables in the database "siatelkom" which is used to accommodate the data system scheduling courses Telecommunications Engineering Program Polines can be seen in Figure 5 as follows.
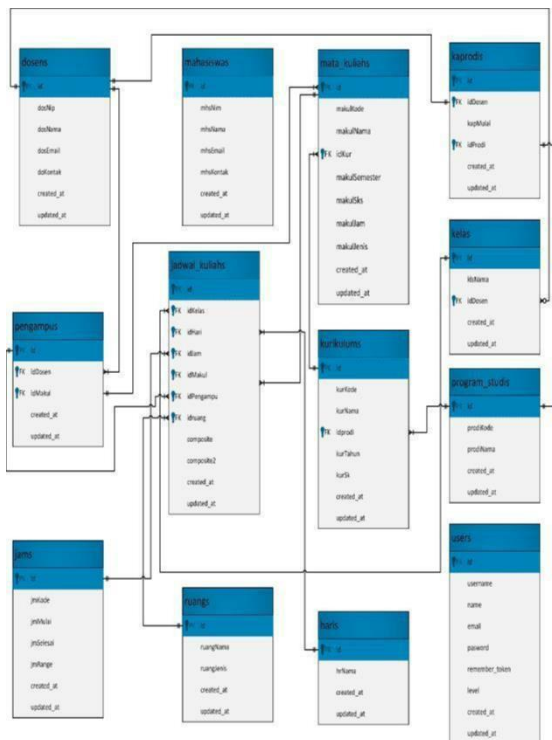

Figure 5 Entity Relationship Diagram (ERD)

System Creation

Making the system includes the installation of software and programming in accordance with the design and system design.

Testing and Analysis   of System Testing Results

Testing is done to know and ensure   that the system has been made to work properly and in accordance with the purpose. The results of further system testing will be processed and analyzed to determine the ability of the system that has been made.

Maintenance

Maintenance stage is done after all the stages are completed by maintaining the system regularly and solve problems   that existed in the   previous stages.

IV.   TESTING RESULTS

System testing is   done with the   purpose to ensure the system has been running well in accordance with the system stretching. Broadly the application test consists of 7 steps, namely, login testing, data addition testing, data change testing, data erasing testing, testing the preparation of course schedules, testing access the schedule of courses, testing logout

1.   Login Testing

The login test is performed to ensure that the user can log into the system. Users must enter a username and password that has been registered on the login form in accordance with the permissions that have different levels. Form filling in user login process with level as Admin is shown in Figure 6 as follows.
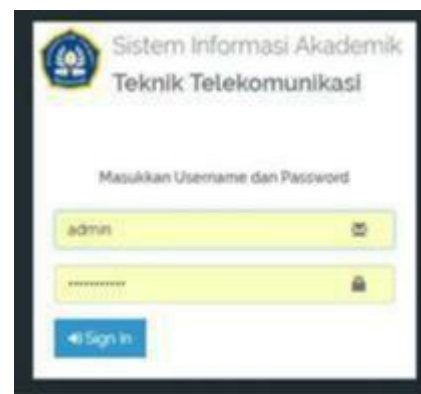

Figure 6 Login Page

After login process by entering username and password as Admin succeed Admin entering new page that is dashboard page with description according to Administrator privileges found on main content of blue in Figure 7.

Figure 7 Page Entering Dasboard As Admin

Figure 7 shows that the Admin as a user has access and the login page has been working according to its function. The level description is tailored to the user permissions logged on the system.

2.   Testing Added Data

Testing the addition of data can only be done by the admin acting as a level that plays a role to manage all forms of data required in the system. In this system user data managed by the admin consists of Kaprodi, lecturers and students. Testing of additional data that can be done by admin include addition of data prodi, user data consist of lecturer, caprodi, student, curriculum data consist of curriculum data and course data, and schedule data consist of space data, day, hour, class and pengampu. The test is conducted to ensure that data can be added to the system. Here is an example step to make additional data that is addition of data Prodi. The first step that must be done is to make the login process by using admin access. After entering the administrator dashboard select Program menu then select the + sign that can be seen in Figure 8 as follows.
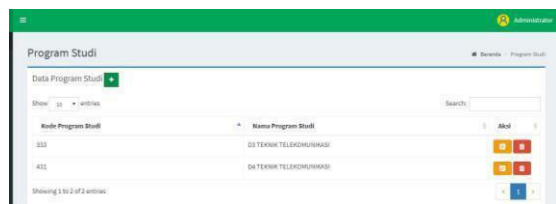
Figure 8 Page of Addition of Prodi Data

Then after that it will get the page form addition of data. The form is filled in and hit the save button as shown in Figure 9. After pressing the save button the data will be saved as shown in Figure 10 as follows.

Figure 9 Page Save Data Prodi Addition
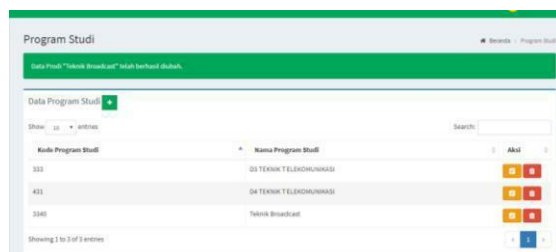
Figure 10 Success page save Data Prodi addition

The success of adding Prodi data that has been shown in Figure 10 is marked with the emergence of new data is displayed as well as there is a message that the data has been successfully saved.

3.   Data Changing Tests

Changing data is an action that can be done by the admin. Testing of data change that can be done by admin include change of study data, user data consist of lecturer, captain, student, curriculum data consist of curriculum data and course data, and schedule data consist of space data, day, hours, class and pengampu. This test is performed to ensure the edit function can change the executed data. Examples of steps to make changes to the data is changing user data lecturer. The first step that must be done is to make the login process by using admin access. Go to the user data menu and then select the lecturer will be displayed data lecturers are ready to edit if there is a change of data. Select one of the data lines and highlight the yellow edit as shown in Figure 11 will be directed to the edit form page as shown in Figure 12. Adjust the desired data and then press the save button. After the save it will be saved the edits are in the database.

Figure 11 In Edit Lecturer

Figure 12 Page Edit Form Lecturer

After the edit is complete the new data will be displayed as shown in Figure 13 as follows.

Figure 13 Successful Page Edit Lecturer Data

4.   Clear Data Testing

Deleting data is an action that the admin can take. Tests deleting data that can be done by the admin include deleting data prodi, user data consists of

lecturers, kaprodi, students, curriculum data consists of curriculum data and course data, and schedule data consists of space data, day, hours, classes and pengampu. This test is done to ensure the delete function can eliminate executed data. Examples of steps to delete data is delete data Prodi. The first step that must be done is to make the login process by using admin access. Go to the menu of the Study Program will then be displayed Prodi data is ready to edit if there is data changes. Select one of the data lines and highlight the red edit mark shown in Figure 14 then the data deletion warning as shown in Figure 15 shows the data in the reduced database that will be displayed on the system page as shown in Figure 16 as follows.

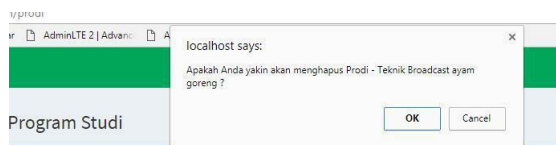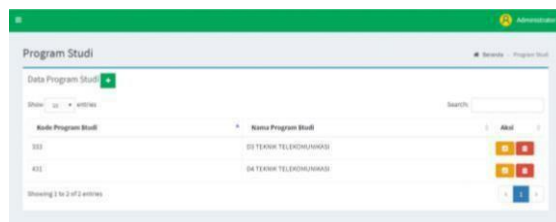Figure 14 Page Program Menu Menu To Be Deleted

Figure 15 Delete Data Warning

Figure 16 Displayed Data Reduced Because Deleted

Figure 16 shows that the deleted data can no longer be displayed on the program menu page.

5.   **Testing of Course Schedule Arrangement**
The preparation of the Course Schedule can only be done by the Head of Kaprodi who has the level of permission of the captain. Testing is done to ensure the process of preparation schedule can be done by caprodi. The following steps are taken to arrange the course schedule. First of course logn first with the level of caprodi then select the course schedule menu and select the scheduling as in Figure 17 as follows.
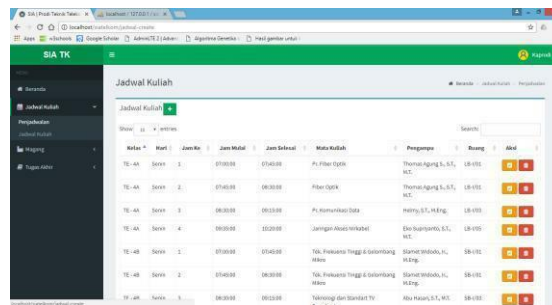

Figure 17 Page Preparation of Course Schedule By Kaprodi

After entering on page schedule of college then to add schedule click + button will be shown page as in Figure 18 as follows.
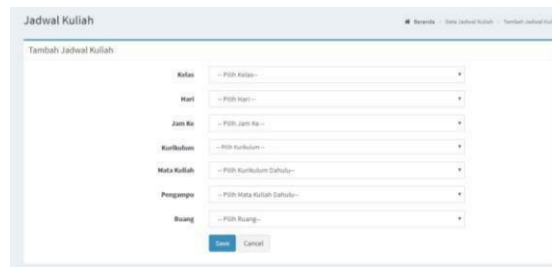

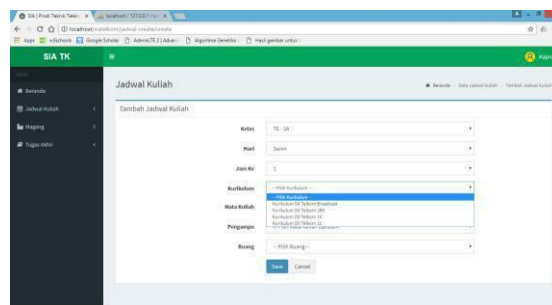Figure 18 Page Form of Course Schedule Preparation

Figure 19 Preparation of Course Schedules

After entering the form then arrange in accordance with the needs of the schedule such as class, day and hour. Define the curriculum first before choosing a course and then a qualifier. Last determine the room to be used for lecturing process
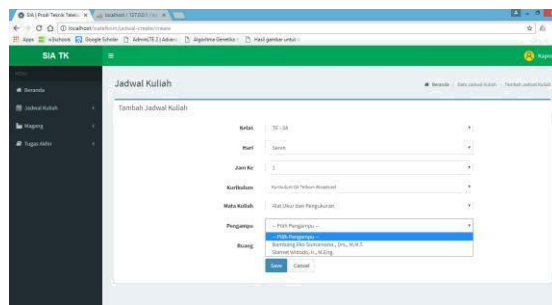

Figure 20 Selection of the Course Captor

In Figure 20 shows the selection of the assigned assigned to teach with the field of expertise. After all is done then click the save button. Next will

appear the data page of the results of preparation as shown in Figure 21 as follows.
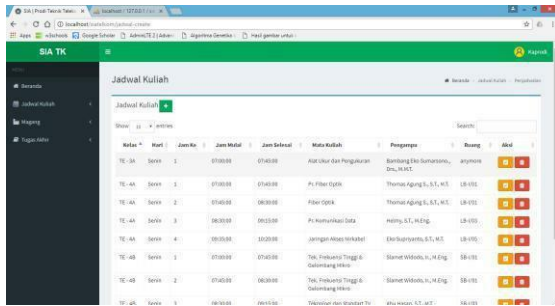

Figure 21 Completed Page Composing Schedule of Course

Figure 21 shows the results of the data composing the course schedule. Once completed the data can be changed or deleted by pressing the yellow button for editing and red to delete on each row of data.

6.   Testing Access Course Schedule

Access the course schedule can be done by all levels of users such as admin, lecturer, caprodi mapun students. Testing is done to ensure that each user can access the course schedule. The first step to access the course schedule is to enter the system

with one of the user level as an example dialkukan login using student access. In the student level display menu select Schedule Lecture it will be directly displayed page schedule courses as shown in Figure 22 as follows.
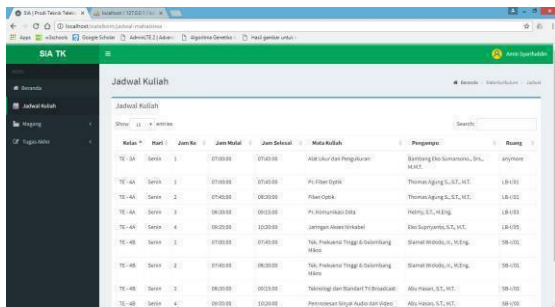

Figure 22 Page Access   Schedule of Course

7.   Logout Testing

Testing Logout or sign out is done with the aim to ensure that the process of signing out on each user can run well and avoid the events can return to the previous page after signing out. Testing sign out is to click Sign out on the user name shown in Figure 23 as follows.

|			
3.	Change Data	and schedule data of existing lectures are then stored according to the changes made	Success
4.	Delete Data	To ensure it can eliminate data already stored in the system	Success
5.	Schedule Arrange Ment	To make sure Kaprodi can arrange the lecture schedule that is required for lecturing process using the system.	Success
6.	Access Data	To test the system can display course schedules at all levels of users.	Success
7.	*Logout*	To test the system can do the logout process	Success
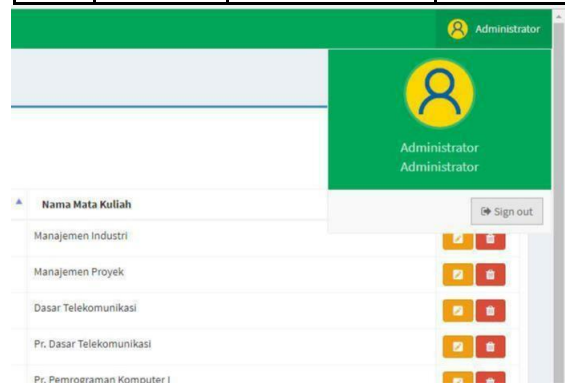
Figure 23 Logout page
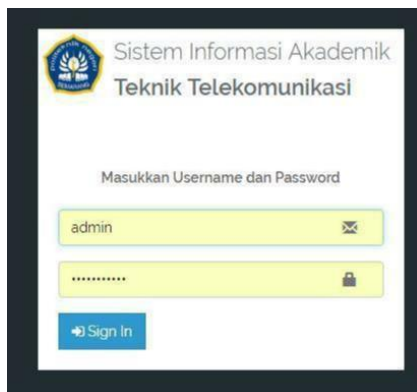
Figure 24 Login page After Sign Out Process

Figure 24 shows the login page display after the user exits. The view after signing out is directed to the login page to secure the user account page. Users are required to login first to be able to log back into the system.

8. Black Box Testing

System Test results are shown in the following table.

Table 1 Functional Testing Ressult

No	Testing	Expectations	Result
1.	Login	If the username and password are correct then it can access the system	Success
2.	Add Data	To test the system to add data into the system such as user data, college schedule data and curriculum data.	Success

V.   CLOSING REMARKS

Conclusion

Based on the data collection, test results and analysis, it can be taken some conclusions as follows:

1. Scheduling System Courses Telecommunications Engineering Polines have been designed.
2. The development of the system using the Laravel framework can be applied to the Scheduling System of Telecommunication Engineering Program Telkom Polynesian.
3. Data management system using MySQL database can facilitate the management of data and tested by black box method to prove all the features can function in accordance with their respective functions.
4. This application is made in the form of websites and integrated with the database, so it can be accessed by the user in realtime on the Intranet network.
5. Preparation of course schedule can be done Kaprodi using web-based information system.

Suggestion

For the purposes of further research and development, the authors present some suggestions:

1. The system in this final project has not been able to provide notification to the user so that it can be developed again by adding notification via email or sms gateway to notify the user when there are changes to the system.
2. The system in this final project still utilize search feature to know the data of course schedule of each class so that not yet can display schedule of course direct according to class or according to user login level.

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