

# Digital Attendance System for Informatics Engineering Students Manado State Polytechnic using a Student Card based on QR Code

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## ABSTRACT

This system will validate student attendance in real time via QR Code into the Informatics Engineering student database. The Informatics Engineering lecture schedule will be integrated into this system, then it will be adjusted automatically to the student data registered in the database. All students registered in this case have fulfilled the graduation requirements and have paid the UKT will be saved in the database and given a QR Code which will later be affixed to the student card. When the student's card is attached to the scanner, the system will automatically check whether the student is registered without any problems. If the student is not or has not been registered, there will be a rejection message from the system monitor. After the scanner successfully reads student data via this QR Code, the system will compare the student data with the schedule stored in the database. Then the system will save the student's entry/check-in time based on the time/hour in the system. Likewise, when leaving, you are also required to check out on a scanner so that the student's entry and exit times for certain courses can be recorded. After the attendance data is saved, the data can be retrieved and then a report is created in PDF and Excel format. Then administrative staff and the Informatics Study Program Coordinator can view and send attendance data to the lecturer in the relevant course. After that, the recapitulation of student absences is proof of student presence digitally and will be used as a basis for course assessment in the Manado State Polytechnic Informatics Engineering Study Program.

## Keywords

Digital Attendance , Student Card, Informatics Student, QR Code

## 1. INTRODUCTION

To be a good campus, of course, good facilities are needed to support learning and teaching activities. Apart from the lecture building, of course it must be supported by good internet facilities. The Manado State Polytechnic Campus has lecture attendance facilities that are in accordance with the course schedule. The existing internet network is able to support administrative activities, whether related to student affairs, personnel and even all departments. In each department there are internet facilities that can be used by staff, lecturers and department heads. Unfortunately, this facility cannot be accessed by students freely considering the small internet quota provided. This especially happens in the electrical engineering department which has the largest number of students at the Manado State Polytechnic. On this basis, we currently need a

Digital Attendance system that can serve all electrical engineering students in the Informatics Study Program.

With the above circumstances, it is necessary to create a Scanner application that can serve students using QR Code- based Student Cards for students majoring in electrical engineering themselves. Seeing the situation and limited internet quota at the Manado State Polytechnic, a wireless network with a web-based attendance information system using a QR Code Scanner is one of the right choices to answer this problem. The aim is to build a system that will simplify the attendance process and recapitulation of student attendance.

## 2. RESEARCH LITERATURE

### QR Code

QR Code or Quick Response Code is a two-dimensional form of barcode. QR Codes were first introduced by Denso Wave in 1994 (Soon, 2008), (Hanks, 2012), (Singh et al 2016). As technology develops, currently QR Codes are not only recognized and read via special scanners but cameras on smartphones, even a webcam. Usually QR Codes contain information such as text, URL links, geo-location, telephone numbers, business cards, and other things that can be embedded. QR Code looks like a small box containing black and white pixels placed randomly as in Figure 1



Fig 1: QR Code

### Time-based One-Time Password

One-Time Password (OTP) is a series of symbols or numbers created as a password and used only once. One use of OTP is for user authentication, for example on social media, online banking, or digital wallets. There are many algorithms for generating OTP, one of which is Time-based One-Time Password (TOTP). According to M'Raihi, et.al (2011), the way TOTP works is to create a password based on the key and time when the TOTP algorithm is used. In general, TOTP has the same scheme as One-Time Password or HMAC-based HOTP, but what differentiates it is the calculation process which involves keys and time so that TOTP can be denoted as

equation (1). Where  $K$  is a random key and  $T$  is time.

$$\text{TOTP} = \text{HOTP}(K, T)(1)$$

The value of  $T$  is calculated based on equation (2). Where

$T_{\text{current}}$  is the current time in seconds,  $T_0$  is the agreed initiation time usually worth 0 ( $T_0 = 0$ ). Meanwhile  $v$  is a parameter that determines how long a TOTP is valid. Usually  $v = 30$  so TOTP is only valid for 30 seconds.

$$T = T_{\text{current}} - T_0v(2)$$

Advances in computer network technology as data processing are growing increasingly rapidly. Since the merger of computer technology with communication technology, data processing which was previously separated between computer units can now be connected to each other via a computer network system. Such rapid development has caused computer networks to be used for the daily needs of millions of people on this earth.

To create computer networks, switches and routers use various protocols and algorithms to exchange information and to carry data to the desired endpoint. Each endpoint (sometimes called a host) in a network has a unique identifier, often an IP address or Access Control Media address that is used to indicate the source or destination of a transmission. Endpoints can include servers, personal computers, telephones, and various types of networking hardware.

A computer network is a telecommunications network that allows computers to exchange data. The purpose of a computer network is to achieve its goals, in each part of the computer network it can provide and request services. The party who receives/requests the service is called the client and the one who delivers/provides the service is called the server. This design is called a client-server system, and is used in almost all computer networking applications. Computer networks may also be created using a combination of wired and wireless technologies. Network devices communicate via wired or wireless transmission medium. For networks that use cables, you may need optical fiber, coaxial cable, or copper cable. Meanwhile, wireless network lines include computer networks that use wireless data connections to connect endpoints. These endpoints include Broadcast radio, cellular radio, microwave, and satellite.

The network can be local or internet. Local networks typically require users to enter credentials to access the network. Typically, it is assigned manually by a network technician or obtained directly by the user via a password or by other credentials. Internet networks such as providing network services do not limit access.

All material on each page should fit within a rectangle of 18 x 23.5 cm (7" x 9.25"), centered on the page, beginning 2.54 cm (1") from the top of the page and ending with 2.54 cm (1") from the bottom. The right and left margins should be 1.9 cm (.75"). The text should be in two 8.45 cm (3.33") columns with a .83 cm (.33") gutter.

OLTP is a form of data processing where each transaction is processed immediately, without delay in collecting transactions into batches. It has the characteristics of a large amount of data but the transactions carried out are quite simple such as insert, update, and delete. The main thing that becomes the concern of the OLTP system is to perform queries quickly and easily to be repaired and accessible. Online Transaction Processing (OLTP), which is a database concept that contains data processing to record daily transactions. Such as: daily sales

transactions.

The characteristics of OLTP:

- Data access is read-write - insert, update, delete
- The orientation of the data in the application is the data taken from the business process
- Character data is not important
- Consistent data activity.

OLAP is based on a concept called a cube. The cube in OLAP is a multidimensional data structure (actual or virtual) that allows fast data analysis. It can also be defined as the ability to efficiently manipulate and analyze data from multiple perspectives. The arrangement of data into cubes aims to overcome the limitations of relational databases. Relational databases are not suitable for fast and close analysis of large amounts of data. Instead, they are better suited for manipulating records (adding, deleting, and updating data) that represent a series of transactions. Online Analytical Processing (OLAP), which is a database concept where data processing is used to analyze data.

Such as sales trends and age. OLAP features:

- Read-only
- Oriented on business subjects
- Data integrated
- Data is historical
- Uncertain data activity

Data extraction is the process by which data is retrieved or extracted from various operational systems, either using queries, or ETL applications. There are several data extraction functions, namely:

1. Automatic extraction of data from source applications.
2. Filtering or selecting the extracted data.
3. Sending data from various application platforms to data sources.
4. Changes in the data layout format from the original format.
5. Storage in temporary files for merging with extraction results from other sources.

Data transformation is a process where the raw data extracted is filtered and changed according to the prevailing business rules. The steps in data transformation are as follows:

1. Mapping the input data from the original data schema to the data warehouse schema.
2. Converting data types or data formats.
3. Cleaning and removing duplication and data errors.
4. Calculation of derivative or initial values.
5. Calculation of aggregate or summary values.
6. Checking data reference integrity.
7. Filling empty values with default values.
8. Merging data.

The last process that needs to be done is the process of loading the data obtained from the transformation into the data warehouse. The way to load data is to run SQL scripts periodically.

### 3. METHOD

The method can be described by the following steps:

1. Data Collection.
2. System Analysis
3. Network Topology Design
4. System Hardware Configuration (Scanner and Server)
5. Implementation of System Software (Database and Interface)
6. System Simulation
7. System Testing.

As the result there are 4 users in this website application.:

1. Admin

Admin will provide the users and information

2. Study Program

The head of Study Program will provide the Schedule Information to Admin

3. Students

This user will provide Student attendance data by using input of QR Code

4. Leaders

The Head of Informatics Engineering is a leader can control the report of attendance

### 4. RESULT

The results of this research are internet services in the Department of Electrical Engineering, Manado State Polytechnic for students, lecturers and staff to be able to have internet access to assist the teaching and learning process so that all reference data collection activities, practicums and even course assignments can be carried out in areas around the Department of Electrical Engineering in 24 hours. The following are the results of the creators of this system:

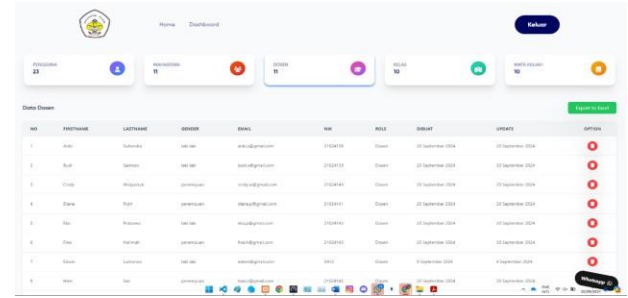


Fig 2: Lecturer Data

The Manado State Polytechnic Attendance Application Login page is designed to facilitate user access, both lecturers and students, to the attendance system. Users are required to enter valid credentials, such as username and password, to ensure data security. The design of this page is simple and intuitive, allowing users to log in easily and quickly. The Manado State Polytechnic Attendance Application Lecturer List page provides complete information regarding all registered lecturers. The intuitive design makes it easier for users to browse and manage lecturer data. Editing and deleting features allow administration to quickly update lecturer information. This page aims to increase efficiency in managing lecturer data and facilitate coordination between lecturers and students.

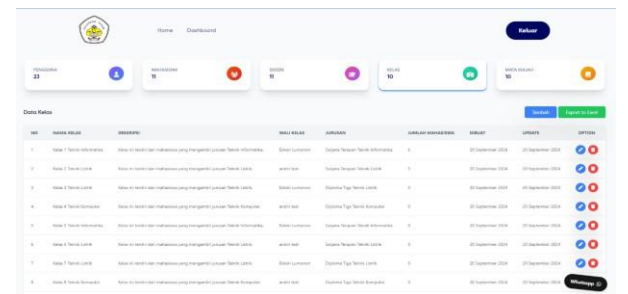


Fig 3: Section Room Page

The Manado State Polytechnic Attendance Application Class List page provides complete information regarding all available classes. This table includes columns for class code, class name, number of students, and teaching lecturer. With a user-friendly display, users can easily browse and manage class data. Features to add, edit, and delete classes assist administration in keeping information accurate and up-to-date. This page aims to facilitate efficient classroom management and improve coordination between lecturers and students. provides a comprehensive overview of attendance, enabling efficient management and responsiveness to administrative needs.

Material page is designed to provide easy access for students to all material related to the courses they are taking. This page lists materials, including titles, short descriptions, and links to download material files such as PDFs or other documents.

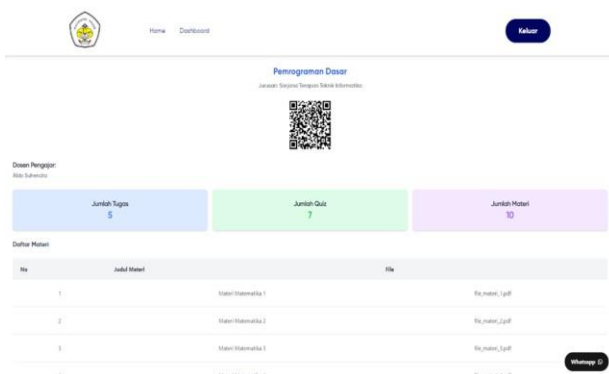
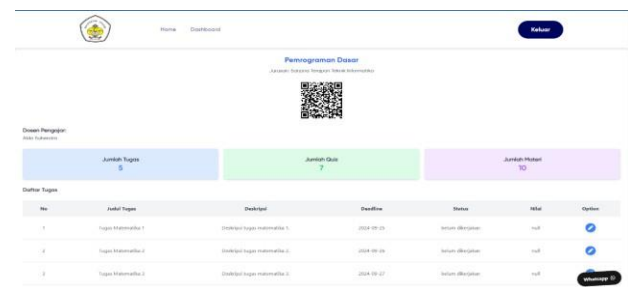
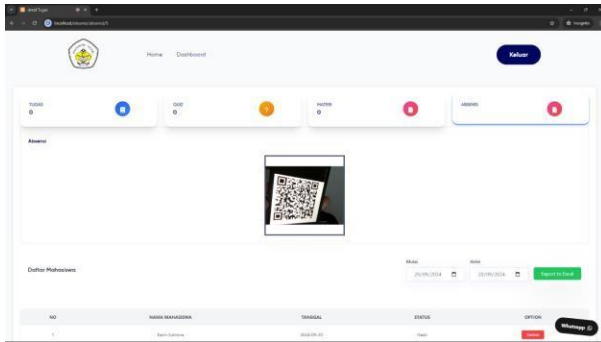


Fig 4: Subjects Data

The Manado State Polytechnic Attendance Application Course



**Fig 5: Attendance and Course Assignment Page**

The Manado State Polytechnic Attendance Application Course Assignment page is designed to provide information about all assignments related to the courses being taken by students. On this page, students can see a list of assignments that must be completed, including details such as assignment title, description, deadline, and points that can be earned. Each assignment comes with the option to download assignment files if available and upload assignment completion documents. Students can also see the status of assignments (completed or incomplete) to make it easier to manage time and priorities.

The Student Attendance page in the Manado State Polytechnic attendance application allows students to view their attendance records. On this page, students can view dates, attendance status, and courses taken. This page is designed to provide transparency and facilitate students in their attendance

throughout the semester.

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## **6. REFERENCES**

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