PRJ 300.5 A Report on

ATTENDANCE RECORD SYSTEM

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ABSTRACT

Attendance is mandatory in educational institutions. There are many new technologies to take attendance. Some of them are fingerprint, RFID, clickers etc. The key concept of all these systems is to digitize attendance data. Digitization is done to store, replicate and transmit data easily and exactly. A computer computes on digital data, thus management of files and generation of reports are automatic. Using the above mentioned technologies require big budget, so many institutions use classical approach for taking attendance, in which teacher calls students' name and ticks the respected box in attendance paper. Our aim is to use this approach but using digital mobile system instead of paper. This technique helps to generate digital files and thus report generation and calculation of student's attendance is automated.

Keywords

Attendance, records, digitization, mobile, digital system, Android

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CHAPTER 1
INTRODUCTION

1.1 Background

1.1.1 Attendance in Educational sector

There is a strong correlation between attendance and subsequent course grade (Cohn and Johnson, 2006, Yao and Chiang, 2011, W. G. Broucek, 2008). By monitoring student attendance teachers are able to identify students who need support at an early stage and put in place measures to help them continue their studies.

When students attend the class, they can obtain more information which is presented by lecturer in the classroom and not included in their textbooks thus it will influence their grades (Credé, Roch, & Kieszczynka, 2010), and it is for this reason that University Regulations require students to attend throughout each semester.

There is a debate between researchers for a long time about the effect of having an attendance policy on the students' results. Some researchers indicated that the class attendance has a strong positive relation to students results (Credé et al., 2010) whereas other researches mentioned that the relation between class attendance and academic performance is ambiguous (Golding, 2011) but this is clear that having any kind of attendance policy will guarantee the presence of students in the class (Golding, 2011).

This brings to the idea of having some tool to control students' attendance.

1.1.2 Attendance systems

The classic method of keeping attendance in an educational environment is that lecturer passes a paper to students and asks them to sign it. After personal computers revolution and also using them in the education, many researchers started to solve attendance problem using computers.

Student response systems or 'clickers' was one of the first technologies which used to take attendance in early 1960s (Judson & Sawada, 2002). Clickers are simply a live polling system for classrooms (Lowery, 2005) but they also used for collecting attendance data (Fies & Marshall, 2006). Each clicker system includes three elements which are: software to design multiple questions or polls and analyze the answers that should be installed on class computer, a clicker or response unit to send the selected answer to the software to analyze and a receiver which also connected to the computer to receive the answers (Kaleta & Joosten, 2007).

A barcode is a machine-readable representation of data relating to the object to which it is attached. Barcodes represent data by varying the widths and spacing of parallel lines. Students are provided with identity cards having barcodes. When swept over reader the identity of student can be extracted and thus attendance is taken.

Radio frequency identification (RFID) is another technology which is used for many purposes including attendance systems. RFID attendance system also has three parts

which are: a RFID tag that has some information, a reader to read the tag information and software installed on a computer as host to analyze the data (Silva, Filipe, & Pereira, 2008). The tag can attach to objects or inside objects, the reader reads tag's information within its wireless range (Chawla & Dong Sam, 2007) and sent to the software.

Fingerprint is one of the biometric systems which is used to recognize a person based on his fingerprint. Each persons' fingerprint is unique, (Nawaz, Pervaiz, Korrani, & Azhar-ud-din., 2009) stable, permanence and easy to take (Zhang & Ji, 2006). A fingerprint system needs a sensor to capture student finger print and also a software which match the fingerprint with the database and show the result on a screen (Nawaz et al., 2009). One of the positive points of this system is that students cannot cheat.

1.1.3 Issues of current attendance systems

All of the above mentioned technologies are used for one single reason, i.e. digitization of attendance data, which in turn facilitate the systematic recording, automatic management and analysis of the attendance data. Data digitization is done because:

- Digital data is easy to transmit, store and share among people.
- A computer can compute on digital data.
- Digital data can be transmitted and replicated exactly.

In order to implement clicker system, the organization should buy a system for each class and also it should order a response unit for each student in the class. This can be done in a small educational environment but for a university with many students, it needs a big budget.

For using the fingerprint system, we have the same problem to provide fingerprint sensor for each classroom and also connect all of the sensors to the server is another problem that requires a big budget also. In order to implement RFID attendance system in addition to the problems that mentioned above, there is a concern that if students trick the system by carrying tags for absent friends, which eventually need the same classical approach of calling names of students in the class for verification by teacher (Michael Dobson et al., 2013). Also there are concerns about privacy and security.

1.2 Problem Statement

The issues raised earlier highlight the following problems:

- Attendance in paper and later entering in computer is time consuming and faces problems like maintaining papers until digitization and revising the record once again (Nawaz T. et al.).
- The technologies like RFID, fingerprint and clicker systems, need big budget to implement.

The problem that our project tries to solve is the digitization of attendance data at the time of taking attendance using Smartphone. It gives alternative approach to take and record attendance. By using the current system (call and tick) as a basic approach, digitization of data while taking attendance helps to reduce the above problems.

In this research, an attendance system based on mobile application which helps teachers to directly digitize the attendance data and manage later, is proposed as solution to solve the mentioned problem.

1.3 Aims and Objectives

To point the problems stated earlier we aim to:

- Develop a system for mobile device, in our context Android application, for taking attendance

The objectives behind building this project are:

- Digitization of attendance record while taking attendance to reduce paper work and to take advantage of digital data.
- Automatic report generation.
- Provide specific mobile app for teachers of Nepal Engineering College (nec) as a replacement to general attendance apps.

1.4 Limitations

There are several limitations to our project. We have only considered three of the aspects of attendance, present and absent. The database we have created is small in table numbers as compared to storage of whole information of student. We have focused only on the required and important variables for the purpose of validating the taken attendance neglecting all the other information regarding students. We have focused on developing mobile application and have not considered much on server side programming.

1.5 Applications

Application area of this system is limited to Nepal Engineering College (nec).

- This attendance recording system is based on the context of Nepal Engineering College, including subject wise attendance, threshold of attendance percent, custom class roll number, custom report format, semester wise subjects etc. So any college having similar provision of attendance as nec can use this app.
- In the context where the entire attendance taking are automated and the data stored are digitized, our application will be very handy and will be a basic requirement. With this system, the teacher could take attendance from mobile phone and upload the data in the server. A server programmed to do the task of report generation, student and guardians notifications, auto e-mailing, marks calculation etc could use this application as the input system.

CHAPTER 2
LITERATURE REVIEW

2.1 Previous Works

Since our focus is concentrated on digitization of data while taking attendance using mobile device, we consulted those papers that outlined the digitization procedures. Various papers describe the digitization of attendance data are:

A paper by Ali Guryel, "*Attendance registration system by radio link*", provides method of electronically registering student attendance data, includes storing a list of student names in a central collection station. The stored student names are downloaded and stored to a portable attendance data collection device. The portable data collection device is used to access the set of student names stored therein. The portable collection device prompts an operator thereof to input attendance data for the displayed student name into the portable data collection device. The operator input attendance data includes present absent, and tardy. The input attendance data for each selected student name is stored in the portable collection device and the foregoing is repeated for each student name in the downloaded set of student names. The input student attendance data is then uploaded from the portable data collection device to the central data collection station and stored in central data collection station using radio link. A student attendance report is generated using the attendance data stored in the central data collection station.

Akhila, K. et al in their paper "An Approach of Mobile Based Student Attendance Tracking System Using Android Application", proposed four modules of the system:
a. *User authentication*, to authenticate teacher on the mobile device, b. *Calling of Web Service*, teacher invokes web service to retrieve list of students belonging to the selected class, c. *Marking Attendance*, teacher marks the attendance in mobile device and sends the details to the remote database, d. *Display information of student*, to display the attendance information of students as per query. The attendance information includes the student's attendance percentage, number of lectures a student has attended for a particular subject, number of lectures missed, as well as the overall attendance.

2.2 Similar Works

The uses of mobile devices to take attendance are researched by various authors and have succeeded in implementing the technology & modules available in mobile devices to the need. Some of them are outlined here.

Learning management system (LMS) is software or program which is created to manage an education organization and one of its usages is to save and generate report of students' attendance (Ninoriya et al.).

Miao Zhongliang and Xu Yuan Jin in the paper, "Mobile attendance method and system", described the use of GPS module of mobile phones to track attendance. The system has two parts: a terminal and a server. The terminal extracts the attendance information and generates an attendance event by utilizing the information. Attendance information includes a terminal identification number, time, location information and job event

information. The terminal then transmits the attendance event to a server, so that the server records the attendance event.

A paper by Dean Bittman, "*Method and apparatus for taking school attendance*", gives a mobile system to take attendance verbally and store the verbal announcement in digital format. An instructor takes attendance by pressing "Announce" key and entering PIN code to verify his/her identity. The instructor then calls out attendance verbally. A recording and storage software routine, then records the verbal announcement, which is digitized by the voice processor of the central office computer and stored as a file in the DVDR of the central office computer.

Michael Dobson et al. in their paper "Attendance tracking system", use RFID to track students entering in a class room. In addition to this, they provide handheld computing devices for use by attendance trackers, such as teachers, to verify the attendance report generated by the scanners and server. This is done to reduce errors that could arise for a number of reasons, such as if a student forget his or her card, or if students trick the system by swapping tags or carrying tags for absent friends. It provides ability for teachers to generate instant attendance reports and verify the attendance within the class period.

CHAPTER 3
METHODOLOGY

3.1 Database Design

Student
The data variables required to sufficiently represent particular student are class roll number (crn) and name, where crn alone can uniquely identify the student of interest. Other information of student such as email, phone, address, image, parents' name & number are the secondary variables which help to represent the student vividly. For our system, we have considered student identification using crn and name along with image of the student for complete representation. Image is used for verification that any student may not call for absent students.

Class
For representation of a class, we consider the variables, *Batch*, *Program* and *Subject*. Batch represents the year of enrollment of the students, Program represents the engineering branch and Subject represents the course for which attendance is taken.

Day
A variable, *DateTime* is used to store the date and time of the teaching event, and particularly represents time and date at which attendance is recorded.

Attendance
Variables *Day*, *Class*, *Student* and *Status* are used to represent attendance taken for a particular date. Here, Day represents the date of attendance taken, Class represent the teaching event as indicated earlier, Student is the information regarding student enrolled for the class and Status is one of three constants *Present*, *Absent* and *Tardy*.

Status
Student's attendance status at teaching time is either of two constants, *Present* and *Absent*. Present indicates the physical presence of a student in a class, *Absent* indicates no presence throughout the teaching event in a class.
These characteristics of database are summarized in table below:

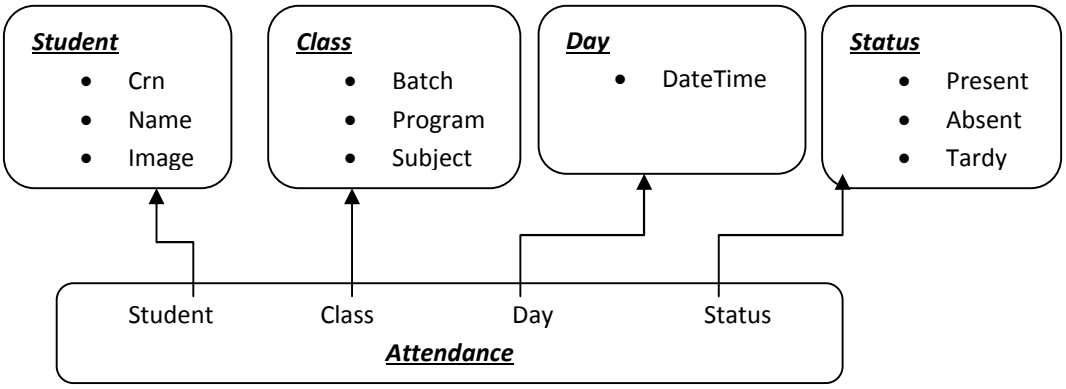


Fig. 3.1: Variables Required for Attendance

The above mentioned entities and their variables can completely characterize student's attendance record. The relationship between these entities can be realized using E-R diagram. The normalized database for the above entities is described using E-R diagram in figures below.

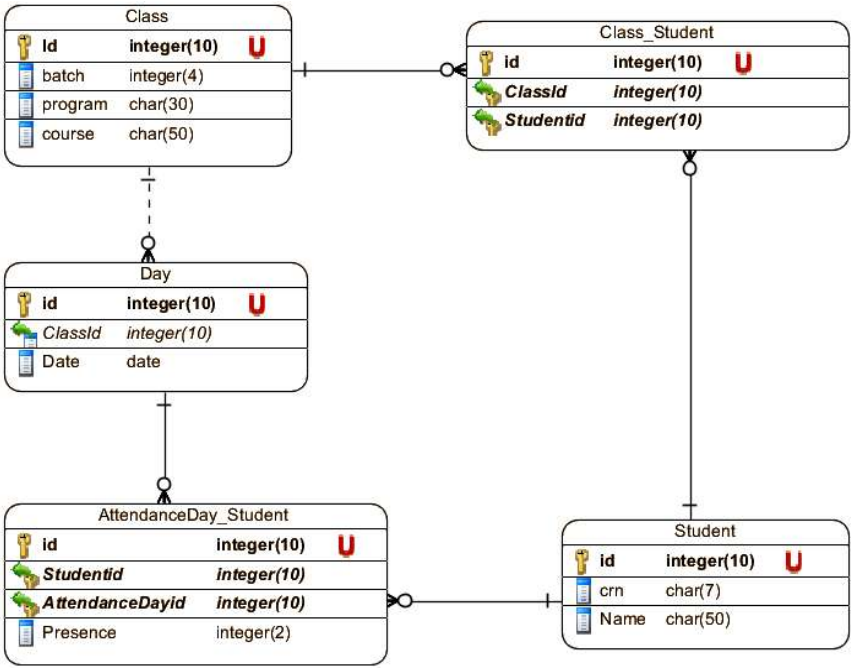


Fig. 3.2: E-R diagram

3.2 System Use cases

A use case diagram is a representation of a user's interaction with the system that shows the relationship between the user and the different use cases in which the user is involved.

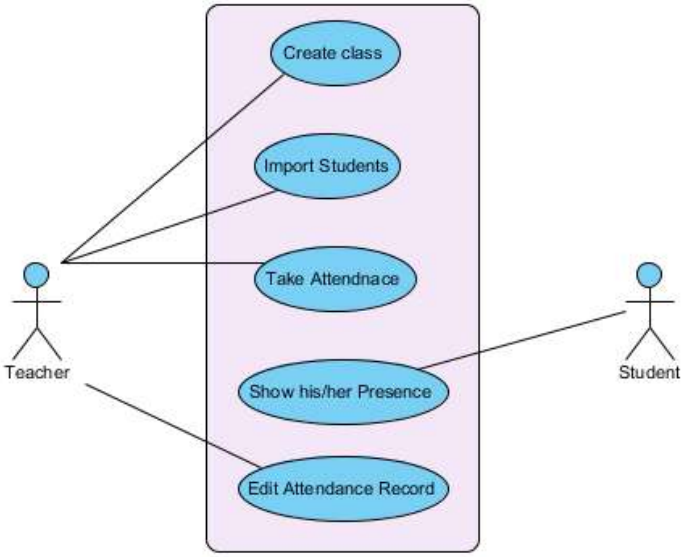


Fig. 3.3: Use Case diagram for taking attendance

3.3 Actions

The different actions that a user performs while interacting with the system are described below.

A. Create Class

Creating a class is a simple activity but a vital and initial act to start taking and recording attendance. The parameters like Batch, Program and Subjects are defined to create a class. Once class is created, adding students, taking attendance, managing records, etc. can be done for the class. Students list and Attendance records for a class are also viewed by selecting the respective class.

B. Import Students

It provides a predefined template defined as a comma separated values (.csv) file. Name and crn of students for the class can be imported from .csv files without regard to the contents of the file as long as the names and crn are in the respective order as given in figure…
Also, data (list of students for particular class) can be accessed from server. A request to server by selecting required class information gives access to the list of students for that class, which then can be downloaded and imported.
Once the import process is completed, with students in the list attendance can be taken.

C. Attendance Entry

After selecting the respective class, an attendance sheet with list of students and checkboxes for each is provided. Attendance is taken by ticking the checkbox for present student and leaving unchecked for absent students. Tardy can be indicated by double tap on check box, also this option is provided upon long click on student's name.
Once attendance is taken, it can be saved in the phone's memory and later upload to server.

D. Attendance Editing

Editing of previously saved attendance is done by the teacher him/herself. A provision of locally saved security code is used as an authentication of authorized person (teacher). Flexibility in editing much of the aspects of the stored attendance is given so as to enhance error free attendances.

3.4 Sequence of actions

The above actions on the system, namely, *Creating Class, Importing Students*, *Taking Attendance*, and *Editing Records*, generate one or more sequence of processes. The sequence of processes that must be carried out by system to perform specific task can be better visualized by sequence diagram. The sequence diagrams for each of these tasks are illustrated below.

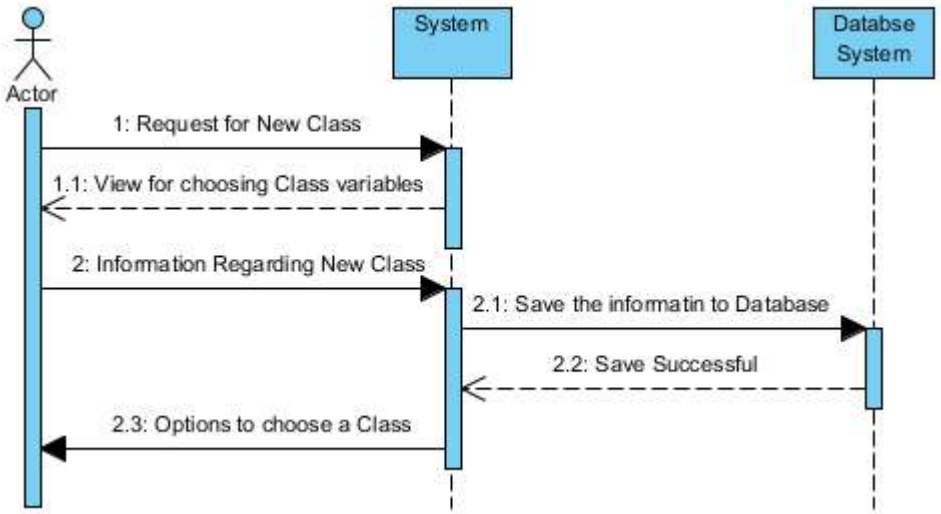


Fig. 3.4: Sequence diagram for creating new class

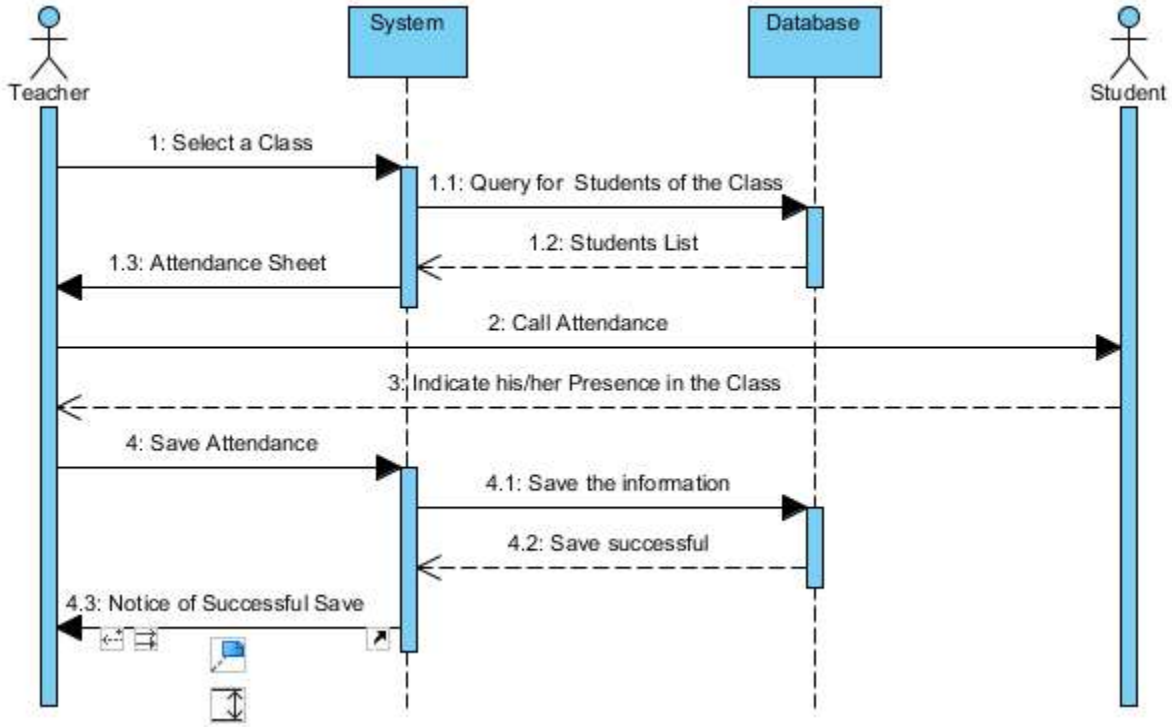


Fig. 3.5: Sequence diagram for taking attendance

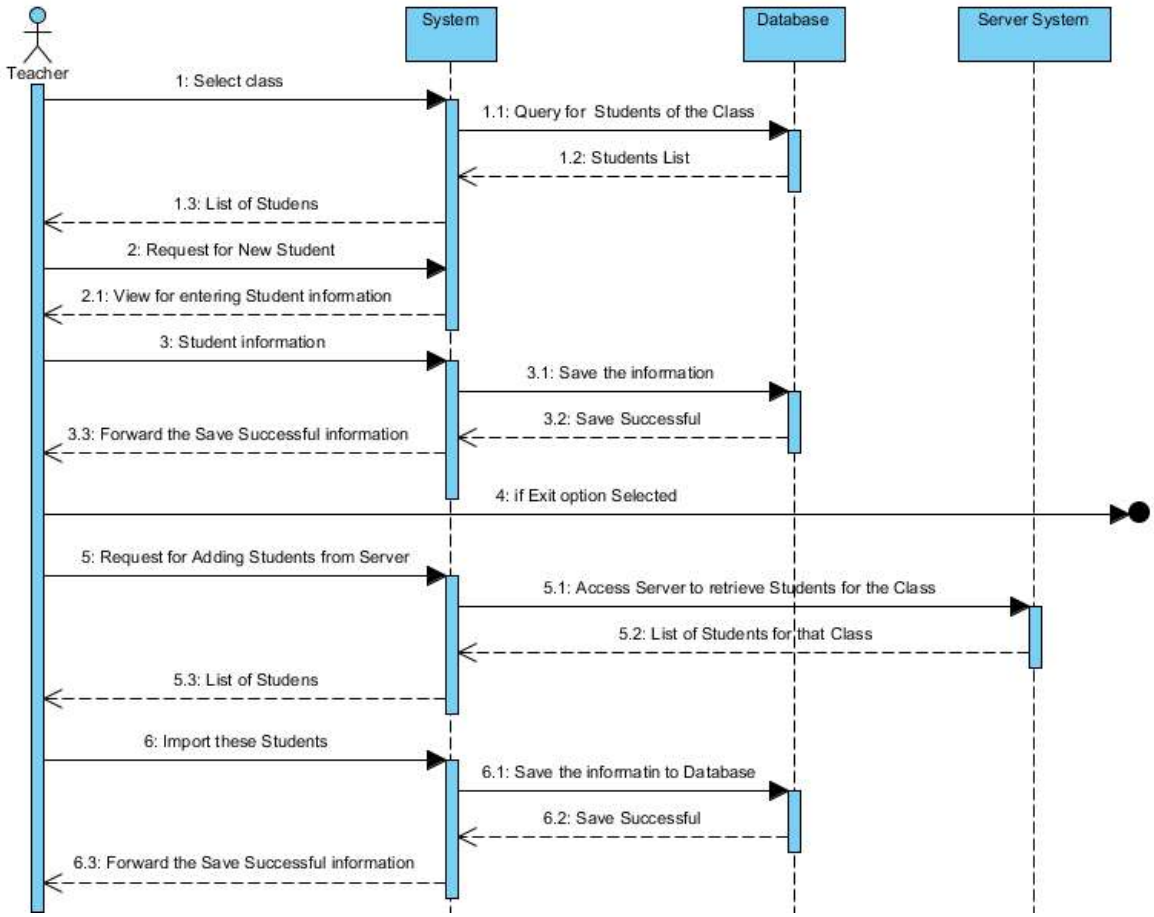


Fig. 3.6: Sequence diagram for adding students

3.5 Attendance Reports

Report helps to summarize the attendance activity of the student. Generation of report is divided into three aspects, Daily, Monthly and Semester End Report.

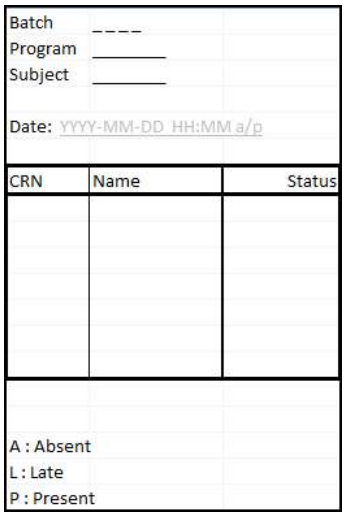
Daily Attendance Report reports on all students absent/ present on the selected date. Generally this type of report is useful for viewing and acknowledging the presences and absents on particular date and total number of students present in the class.

Monthly Attendance Report reports attendance for the selected month. This report is useful for evaluating students' regularities in a month and tracking students with attendance problems. The teacher could then consult the students with low presence and provide them with necessary resources. This type of report is generated at the end of month automatically.

Semester End Report is the concatenation of all *Monthly Attendance* Report of a class and gives information about every student's presence on each class days and also generates cumulative attendance. This report acts as a main basis for evaluating students'

regularities and also for calculating attendance marks. This report also helps to identify students with presence percent below threshold value as defined by university.

Attendance Report formats is given in the following figures:



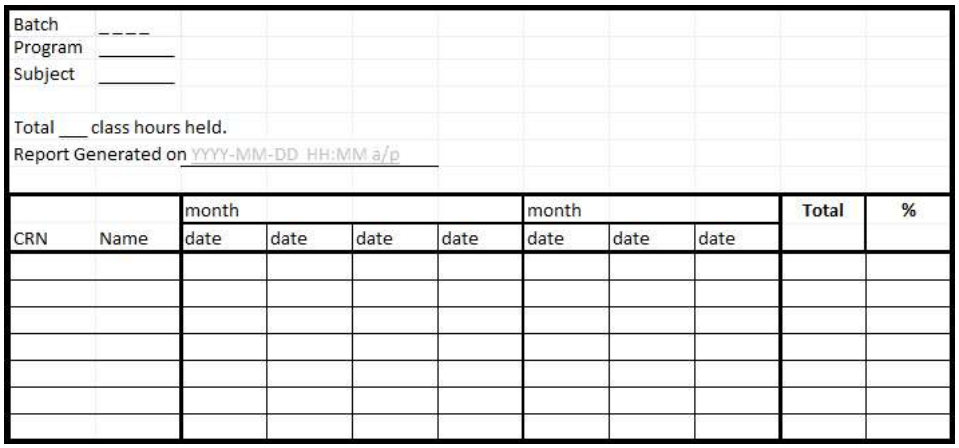
Batch ____
Program _____
Subject _____

Date: YYYY-MM-DD HH:MM a/p

CRN	Name	Status

A : Absent
L : Late
P : Present

Fig. 3.7: Daily Attendance Report



Batch ____
Program _____
Subject _____

Total ___ class hours held.
Report Generated on YYYY-MM-DD HH:MM a/p

		month				month			Total	%
CRN	Name	date	date	date	date	date	date	date		

Fig. 3.8: Semester-End Report

CHAPTER 4
FURTHER WORKS

There are different directions in which this project can be expanded. This section describes further work that could be done to enhance usability.

Server
Update attendance record in server. Design server to provide absenteeism notification, auto messaging to students and attendance report generation.

Database
Expand database so as to store

- more information of students like students' address, emails etc.,
- remarks regarding performance of students for each class period,
- additional class information like assignments for the day and students submitting the assignment,
- and ultimately, store these data to a server

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CHAPTER 5
CONCLUSTION

The system thus developed digitizes the attendance record right at the time of taking attendance, thus saving time of teachers to enter the record in computer again. The system reduces the additional cost endured for hardware requirement, since it's developed for Smartphone.

The digital files obtained after saving attendance data are used to generate report and provide information at hand. The time taken to calculate percentage of presence is thus reduced.

This project provides a basic input system for large and automated systems which handle students' data. The system thus can be expanded to many directions, from recording attendance to tracking assignments, updating regular activities and progress in exams and accessing students' overall information.

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