Diary Management System

Advanced
Database Design
CS-603-B

TechME

Sacred Heart University
School of Computer Science & Engineering
The Jack Welch College of Business & Technology

Submitted To
Dr. Reza Sadeghi

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Project Phase 06 for
Diary Management System (DMS)

TechME

Team Members

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2. Ankush Chaudhari .....chaudharia@mail.sacredheart.edu

Roles of Team Members

1. Kiera Cutri .....(Team Head)

2. Ankush Chaudhari .....(Team Member)

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Team Member Introduction

Kiera Mariah Cutri
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Kiera Cutri is a current Computer Science graduate student at Sacred Heart University; they have previous experience with C++, C#, Java, and Python. Kiera has previously worked at the Sacred Heart Factory as a level one technician for 3 years where she gained experience with troubleshooting various software issues; she has also performed various repairs and upgrades to their laptop.

I met Ankush after the first Advanced Database course and we conversed about interests, backgrounds, and hobbies. After finding common ground for interests, I thought that he would be a good partner for the project, he reached out to me first regarding group work. The team leader was decided through a discussion of responsibilities and through deciding who would prefer to take the role.

Ankush Chaudhari
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I am Ankush Chaudhari. Currently, I am a graduate student at Sacred Heart University. I have completed my Undergrad in Electronics and Telecommunication Engineering. After I completed my degree, I worked for MNC as an implementation consultant for 1.6 years. My role was to handle ERP systems, Client relations Project Management, Vendor Management, provide clients hands on training on the system, and design and integrate the system according to client requirements. I am very passionate about my work role. my team had received an extra mile reward for completing the project before the deadline.

It was the first day of my Database Management class. I was seated in the first row. Kiera was seated towards my right. We had little conversation regarding the software installation and some doubts. After class we had a brief conversation regarding our backgrounds. Kiera completed her undergraduate in gaming, she also told me about her interest in various programming languages which she has known. On that point I decided that Kiera is a perfect team partner and head, so I approached her and now we are a team.

Purpose

The purpose of the Diary Management System (DMS) is to aid staff members within a department to collaborate and organize in a school setting. This system allows faculty members to update their activity details within a diary that is accessible to relevant users. Permitted users will have access to the activity of specific events that have been logged within the system. This proposed system aims to minimize the time burden imposed on faculty members by allowing users to search for a colleague's log within their diary. The Head of Department (HOD) will be able to view each faculty member's diary logs.

Scope

TechME aims to produce an application that will provide greater ease for users by allowing users to effortlessly search and find records that pertain to other colleagues. This system provides users with an advanced and secure way to store documents that can be accessed by higher ups within a department.

Motivation

These days, everything tends to be stored within databases. Our staff continues to use more traditional logging methods when recording work information. To make the most out of current technology, we are creating the DMS which will allow faculty members to upgrade their work from traditional logging techniques to databases.

Literature Survey

Keeping logs to maintain work records daily allow faculty members to keep track of their work in their department. Each faculty member can keep and maintain a traditional diary which stores logs of their workday. Faculty members input various information relevant to their workday such as attendance, course number, semester taught, comments for the class, and content covered during lecture. The diary logs are later reviewed by the Department Head at the end of the day. Within our college, every faculty member keeps and maintains a work diary to enter logs of their workday daily. By maintaining a work diary, it allows faculty members to detail their workday and keep a log that would be available to other coworkers within their department. By having a diary system in place, it allows others to know the daily routines of faculty members and allows for easier assignment based on availability.

We were able to gauge an idea of how this system would work based on an online example of a diary management system on sourcecodester.com [2].

Pros and Cons

When considering the Diary Management System. We considered potential positives and negatives that would attribute to the system. The primary positives of the system would be that it would provide an accurate timeline of events and permit for easier scheduling of employees. The system would be able to support multiple team members at once and would allow coworkers to hold each other accountable for each other for specific actions preformed. The primary potential negatives we came across for this project would be a decrease in teamwork among members, large data size which use large pieces of software which would occupy multiple megabytes of diskspace, there could be an annual recurrent maintenance cost, and an ethical concern for privacy.

For more information regarding this project, please refer to the following github repository: https://github.com/cutrik/CS603-FinalProject

Entities and Keys

When selecting entities for our project, we examined how a university or college works and attempted to mimic how they operate within a database. We began by looking at the direct relationships among members of an institution; we noticed that there were individuals who worked for the institution which fell under faculty or staff members. We noticed that students interacted with both faculty and staff. Since faculty and staff members played a vital role in the Diary management System, we included them in our entity list.

We observed that the institution utilized multiple buildings and classrooms which members of the institution interacted with. When we looked to how faculty members use the building, we included aspects which were being used. Building name, classroom location, department, and the subject which the faculty member taught were all aspects of the institution which would allow for more detailed diary entries. Faculty members have information that pertain to themselves and to other aspects of the institution such as scheduling and teaching. Faculty members belong to different departments based on their specialized subjects which impact what they would teach to students.

We noticed that the faculty members schedules aligned with what students would take based on what the faculty member would teach. We thought it would be important to include aspects of the student and faculty interaction in our database by using student class status and student schedule. We noticed that students typically had declared one major but would still take a variety of subjects for their schedule. With each subject that a student would take, each class would occur at different times and different days for varied durations.

ER to EER Model

After considering what all our entities would be for the DMS, we broke down what attributes would be a part of each entity. We viewed each entity and determined which ones were strong and which ones would be weak; afterwards, we listed what type of relationship each of our entities would have with each other such as many to many, one to one, and one to many. After determining the relationships between entities, we transferred this into an ER Model. Once the ER Model was created, we transferred the information into an EER Model by adding datatypes to each attribute. We kept the names of entities and attributes across models.

For the visuals of these models, please refer to the figures on pages 7 and 8.

SQL Code

When writing the code for the database we referred to w3schools.com [5] and guru99.com [4] for how to write and format primary keys and foreign keys. The image above links to a copy of the SQL code for the Diary Management System.

Models and Figures

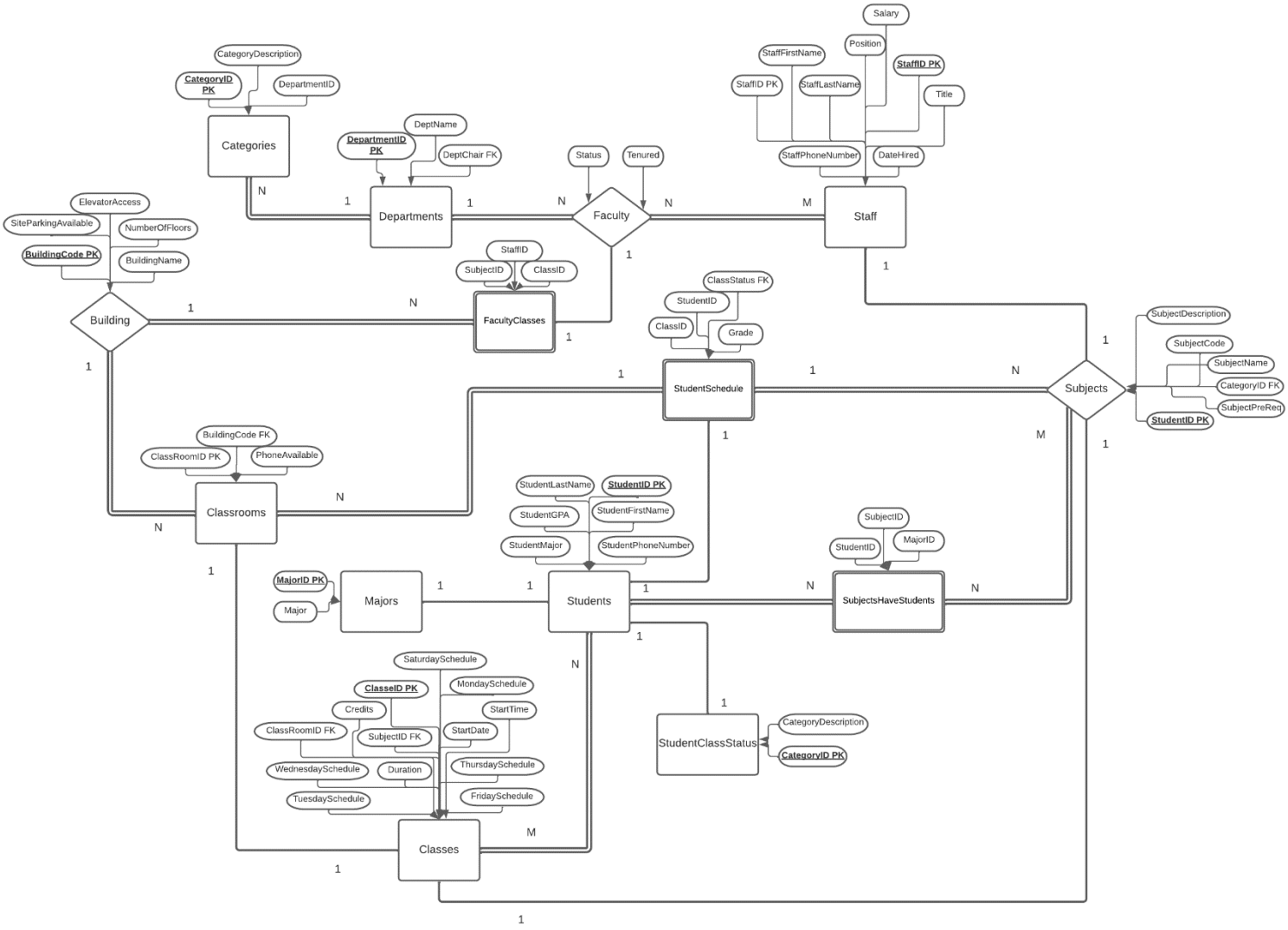
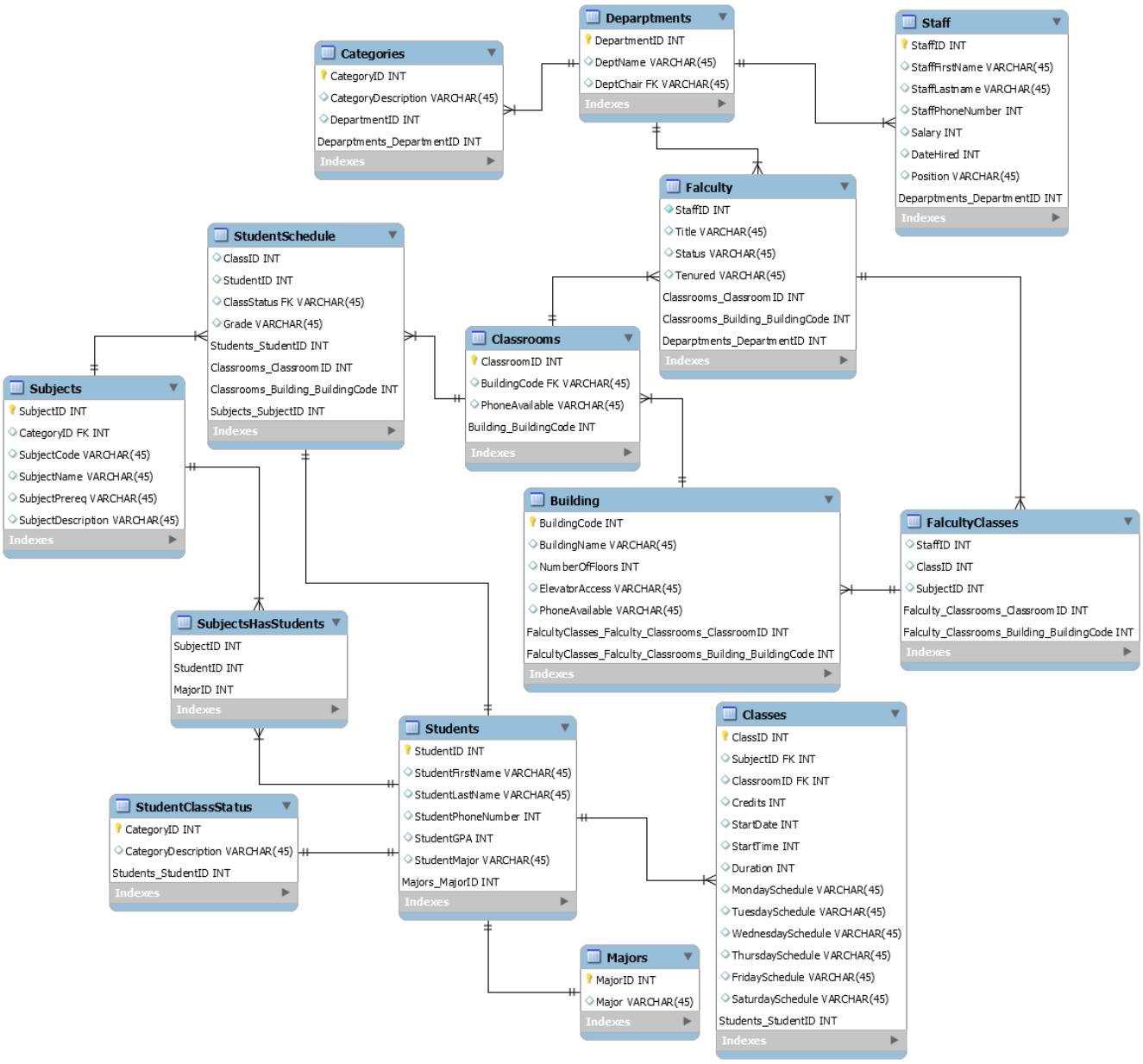


Figure 1: ER Model

Created in Lucidchart at www.lucidchart.com [3]



[1]

Figure 2: EER Model

All Entities, Attributes, and Keys

Faculty
StaffID PK
Title
Status
Tenured

Staff
StaffID PK
StaffFirstName
StaffLastName
StaffPhoneNumber
Salary
DateHired
Position

Departments
DepartmentID PK
DeptName
DeptChair FK

FacultyClasses
StaffID CPK
ClassID CPK
SubjectID CPK

Subjects
SubjectID PK
CategoryID FK
SubjectCode
SubjectName
SubjectPreReq
SubjectDescription

Classes
ClassIDPK
SubjectID FK
ClassRoomID FK
Credits
StartDate
StartTime
Duration
MondaySchedule
TuesdaySchedule
WednesdaySchedule
ThursdaySchedule
FridaySchedule
SaturdaySchedule

Classrooms
ClassRoomID PK
BuildingCode FK
PhoneAvailable

Building
BuildingCode PK
BuildingName
NumberOfFloors
ElevatorAccess
SiteParkingAvailable

StudentSchedule
ClassIDCPK
StudentID CPK
ClassStatus FK
Grade

Students
StudentID PK
StudentFirstName
StudentLastName
StudentPhoneNumber
StudentGPA
StudentMajor

SubjectsHaveStudents
SubjectID
StudentID
MajorID

StudentClassStatus
CategoryID PK
CategoryDescription

Majors
MajorID PK
Major

Categories
CategoryID PK
CategoryDescription
DepartmentID

SQL Code

When creating our database, we observed how most systems work in a school setting. When looking to things like if a faculty member were tenured, if a phone would be available, or if an elevator would be available in the building, we decided to use a single character to indicate if these things were available by having a yes (‘y’) value or a no (‘n’) value. Information such as titles, names, positions, and schedule we were unsure how many characters the user would input so we made sure to make these attributes variable characters. Initially, for attributes such as date hired, phone number, salary, and credits we thought that these values would be stored as integers and have allotted a value for how many digits would be input by the user. We later changed these values to reflect the variables more accurately in the database. As an example, we changed phone number from an integer value to a character value based on how this does not change, we kept the number of digits the same based on phone numbers containing ten digits in the United States. The variable ‘GPA’ was changed from integer to a float value based on how the value for a grade point average is stored on a four-point scale at Sacred Heart University. For attributes such as subject code, subject name, and other class identifying attributes we had adjusted these to be character values based on a mixture of a set number of letters and numbers.

Example of Insertion Error

INSERT INTO subjectsHaveStudents (subjectID, studentID, majorID) VALUES ("ASTO" , "0835019", 11650)

Error Code: 1452. Cannot add or update a child row: a foreign key constraint fails (`universitymanagement`.`subjectshavestudents`, CONSTRAINT `fksubjectID` FOREIGN KEY (`subjectID`) REFERENCES `subjects` (`subjectID`)) 0.016 sec
INSERT INTO subjectsHaveStudents (subjectID, studentID, majorID)
VALUES ("ASTO", "0835019", 11650);

Constraints Protect from Invalid Entry

Different constraints were used in our database to prevent invalid inputs; some such constraints were in the form of primary keys and foreign keys. Some examples that we had used in our database were through the datatype float, datetime, and time. Float was used for the attribute “studentGPA”, by having this value be a limited decimal value, it allows the data to be specified as a numeric value while if this value were a different datatype, it would open the ability for incorrect data. Another datatype that was used was time and datetime; these datatypes require input in a valid format and will reject the input if the formatting is incorrect, this decreases the input of incorrect data through mandatory formatting and only acceptance of numeric values. We had used the time and datetime through the “startDate” and “startTime” attributes. Additionally, we used multiple constraints through keys. Some such examples of keys we had used were primary and foreign keys. By using these keys, it assures that the data must remain consistent with the primary key to run without error; an example of a primary key we had used was “studentID”, we had referenced this through foreign keys in tables such as “subjectID”. As a foreign key, if the information about the datatype, the information input, or the length allotted did not match the primary key, the data would not store and would need to be edited.

Altering Our Code

When adjusting our code, we had to either add columns or adjust datatypes of attributes. We preformed these changes through a sequence of alter commands in our code. For the table "staff" we added the column for birth date and used an update command to input the data per identifying number for staff members in the database. We additionally preformed multiple modify commands to change previous datatypes to more efficient and relevant ones. The following are some code excepts for where these changes were made:

1) ALTER TABLE staff
   ADD dateOfBirth datetime(6);

   UPDATE staff
   SET dateOfBirth = CAST('1989/01/22' AS DATETIME)
   WHERE staffID = 0216659;

staffID	staffFirstName	staffLastName	staffPhoneNumber	salary	dateHired	position
0216659	Benett	Beril	914888594	80000	1996-07-06 00:...	Instructor
0326598	Hope	Jerker	2035945948	85000	1999-02-21 00:...	Professor
0458894	Lex	Long	2035845948	75000	1998-12-22 00:...	Secretary
NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 3: Before Alter staff

staffID	staffFirstName	staffLastName	staffPhoneNumber	salary	dateHired	position	dateOfBirth
0216659	Benett	Beril	9148885948	80000	1996-07-06 00:...	Instructor	1989-01-22 00:00:00.000000
0326598	Hope	Jerker	2035945948	85000	1999-02-21 00:...	Professor	1999-03-06 00:00:00.000000
0445678	Erna	Hanne	8895694581	81000	1999-09-03 00:...	Associate Professor	1966-12-22 00:00:00.000000
0458894	Lex	Long	2035845948	75000	1998-12-22 00:...	Secretary	1966-08-15 00:00:00.000000
0468994	Racquel	Hollis	2055875148	65000	2015-10-22 00:...	Secretary	1987-08-11 00:00:00.000000
0469994	Marju	Danni	2059895178	80500	2017-12-03 00:...	Professor	1974-07-12 00:00:00.000000
0528464	Lucretia	Erika	2036689457	80000	2018-10-22 00:...	Associate Professor	1980-09-12 00:00:00.000000
0554864	Affan	Eukleides	5946581265	90000	2003-05-06 00:...	Professor	1969-07-30 00:00:00.000000
0648464	Modesta	Jonatan	2098469958	85000	2019-12-11 00:...	Professor	1989-10-02 00:00:00.000000
0828164	Sundar	Malena	2994859162	80000	2020-01-03 00:...	Assistant Professor	1978-07-12 00:00:00.000000
0854864	Zaahir	Halcyone	3694581596	60000	2021-01-16 00:...	Instructor	1997-02-06 00:00:00.000000
0864761	Adela	Euthymius	9564855574	75000	2022-01-15 00:...	Instructor	1994-06-09 00:00:00.000000
NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL

Figure 4: After Alter Staff

2) ALTER TABLE falcultyClasses
   ADD subjectID varchar(8);

staffID	classID
0216659	1011
0648464	1021

Figure 5: Before Alter falcultyClasses

staffID	classID	subjectID
0216659	1011	N/A
0648464	1021	N/A
0554864	2021	N/A
0854864	3021	N/A
0469994	3022	N/A
0326598	4021	N/A
0326598	4022	N/A
0528464	5021	N/A
0445678	6021	N/A
0445678	6022	N/A

Figure 6: After Alter falcultyClasses

3) ALTER TABLE categories
MODIFY subjectID char(8);

UPDATE categories
SET subjectID = CAST('ASTRO' as char)
WHERE categoryID = 'ASTR1265';

categoryID	subjectID	categoryDescription	departmentID
ASTR1265	5648	Study of the universe	10000000
MEDI2294	6689	Substance preparation to treat disease	20000000

Figure 7: Before Alter categories

categoryID	subjectID	categoryDescription	departmentID
ASTR1265	ASTRO	Study of the universe	10000000
BIOL4489	BIO	Living organisms	40000000
CHEM3364	CHEM	Properties, composition, and structure of eleme…	30000000
MEDI2294	MED	Substance preparation to treat disease	20000000
PHYS5591	PHYS	Properties of matter and energy	50000000
PSYC6684	PSYCH	Human mind and its functions	60000000
NULL	NULL	NULL	NULL

Figure 8: After Alter categories

4) ALTER TABLE building
MODIFY buildingCode varchar(6);

UPDATE building
SET buildingCode = CAST('1945-A' as varchar)
WHERE buildingName = 'Astronomy Building';

buildingCode	buildingName	numberOfFloors	elevatorAccess	siteParkingAvailable
1956	Astronomy Building	5	y	y
2956	Medicine Building	3	y	y
NULL	NULL	NULL	NULL	NULL

Figure 9: Before Alter building

buildingCode	buildingName	numberOfFloors	elevatorAccess	siteParkingAvailable
1945-A	Astronomy Building	5	y	y
2234-B	Medicine Building	3	y	y
3017-C	Chemistry Building	2	n	y
4885-D	Biology Building	2	n	y
5675-E	Physics Building	1	n	y
6841-F	Psychology Building	2	y	y
NULL	NULL	NULL	NULL	NULL

Figure 10: After Alter building

5) ALTER TABLE studentSchedule
MODIFY studentID char(8);

classID	studentID	classStatus	grade
4021	835561	Active	N/A
4022	815948	Active	N/A

Figure 11: Before Alter studentSchedule

classID	studentID	classStatus	grade
4021	0835561	Active	N/A
4022	0815948	Active	N/A
3022	0715849	Active	N/A
3022	08269458	Active	N/A
5021	0835945	Active	N/A
5021	0819481	Active	N/A
2021	0835019	Active	N/A
1011	0835447	Active	N/A
5021	0801594	Active	N/A
4022	0835011	Active	N/A

Figure 12: After Alter studentSchedule

Optimization

When optimizing our database, we carefully reviewed our code to see how best to optimize for the best performance. We had already produced some good optimization techniques from the beginning of the creation of our database such as selecting specific columns for insertion of values instead of calling the entire table, we avoided running queries in loops, we used ‘create table if exists’, and used the ‘where’ command instead of ‘having’. Based on good coding practices, we did not need to adjust the database to further optimize.

By using the ‘where’ command instead of the ‘having’ command it allows for faster execution of the database since the database will perform the command immediately while the ‘having’ command would wait to preform the command until the end of execution of the database. This can be seen when the data for some tables has been updated.

```
UPDATE categories
SET subjectID = CAST('ASTRO' as char)
WHERE categoryID = 'ASTR1265';
```

By using the command ‘create table if not exists’, allows for the database to overlook tables if they already exist and immediately go to the next command; this allows the program to continue running without the risk of duplication.

```
create table if not exists departments(departmentID int(8),
deptName varchar(25),
deptChair varchar(60),
CONSTRAINT pk_departments_SID PRIMARY KEY(departmentID));
```

GUI

When in the process of creating our graphical user interface (GUI), we referenced multiple projects to gain an idea of how to produce a proper and fully functioning GUI. We have attempted to manipulate and edit various projects to attempt to incorporate them into our project. For the login page of our application, we borrowed code from an online resource [6], we have attempted to adjust the login page to redirect to another GUI application but received errors and are in the process of fixing this. In the login GUI, there are multiple functions for each portion of the login process; each of these functions are called in a main function which is then called at the end of the code, the main function calls all previous functions and triggers them based on user interaction with buttons on the GUI. The functions are first designed then an additional function is preformed to create the window, each portion of the login GUI has either a functionality implementation, popup implementation, or event implementation.

The following figures are from the login GUI.

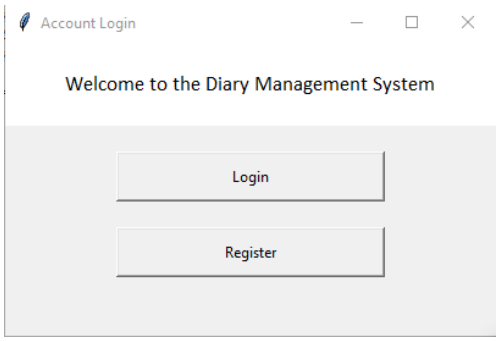


Figure 13: Welcome Page

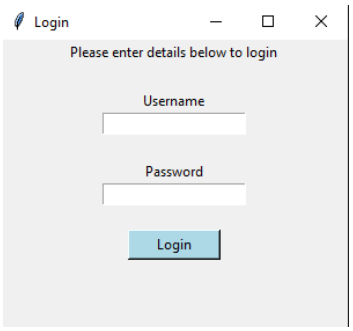


Figure 14: Login

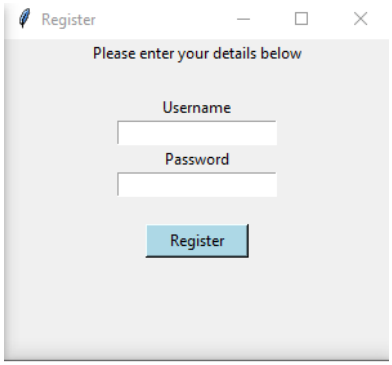


Figure 15: Registration

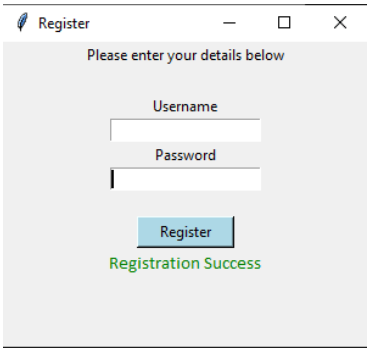


Figure 16: Registration Success

Figure 17: Login Success

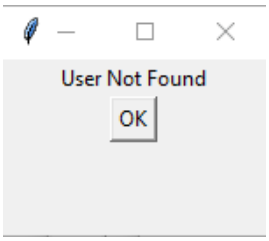


Figure 18: User Not Found, Denied Login

We attempted to rework our login code to connect to our database, we also made sure to allow the GUI to obtain the username and password from the database instead of reading from a text file.

The following excerpt is the connection to the database:

```
import mysql.connector

db = mysql.connector.connect(
host="localhost",
user="root",
passwd="Ankush@11",
database="universityManagement")
```

To obtain the username and password we can obtain these two fields through the following code in the GUI:

```
uname = e1.get()
password = e2.get()
cursor = db.cursor()
```

Future Work and Conclusions

This project has allowed us to further develop our communication skills, time management, peer review, peer accountability, the ability to delegate responsibilities, and refine our understandings of concepts through careful discussion and explanation with each other.

For the future of this project, we would like to create a fully working graphical user interface. We would also like to polish the aesthetic appearance of the application; one such way we would attempt this is by taking original photos and creating an original logo to incorporate into the application. We would like to optimize the graphical user interface to run more efficiently after having a more complete implementation. We would like to add security features to prevent malicious attacks on the database. Additionally, we would like to attempt to create a single executable file for the application rather than having multiple python files.

Citations

1. Viescas, John L. “School Scheduling Modify Database Page 883.” *SQL Queries for Mere Mortals: A Hands-on Guide to Data Manipulation in SQL*, Pearson Technology Group Canada, 2018.
2. elinet. “Elinet.” *Free Source Code, Projects & Tutorials*, 11 Sept. 2014, https://www.sourcecodester.com/php/7943/online-diary-management-system.html.
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6. Saba, Gulsanober, et al. “Python GUI Login - Graphical Registration and Login System in Python.” *Simplified Python*, 4 Mar. 2020, https://www.simplifiedpython.net/python-gui-login/.