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by

Introduction

0.1 Introduction

The project is a web based learning management portal. In the past few years, the demand of online learning systems is increasing day by day. The use of these type of system reduces the work load. LMS helps both students and teachers in aspects like students attendance, updating the timetable and evaluation of marks. It make very easy for students and the teachers to upload assignments, quizzes or post an update. Students can print their fee challan, check their attendance, view their assignments and quizzes marks very easily. In this LMS we have provided all these functionality for the teachers and students. This LMS project is divided into various modules Student Information and Fee Module, Mark assessment and assignment module, Feedback module. Our main module in this LMS project is Student Information and Fee Challan printing Module.

0.2   Purpose

Currently, there is no online learning management system for GCU with all these functionality we described above. Our system enables a secured encrypted login for the student, where there can perform the traditional task like assignment upload, quiz solving and attendance, view course details, however the additional functionality we have included is the fee information and printing of fee challan. After this students do not need to go to university fee section, they can print their fee challan using the LMS from their home. They can also check the status if their fee is paid or not.

0.3   Project Scope

This web app will enable students to check their fee status for any semester and will enable them to print the fee challan. It will also show them their fee status if fee is submitted or not. The data is fetched from the database which is synced with university main central database.

Requirement Specification

0.4 Functional Requirements

- Student will be enrolled by the system admin.

- Student can then login to the portal.

- After login, student can view his personal details.

- Student can submit assignment and quizes.

- Student can check his/her attendance.

- Student can view fee challan and print it.

- Student can view details about his/her courses and ask teacher any questions.

0.5   Non-functional Requirements

- The web application should be user friendly.

- Web app must provide secured login to the students, teachers and admin.

- It should be available 24/7.

- It should be in a working state without any major errors/bugs.

- The web app should be optimized for the server performance.

- It should be responsive and should not put significant load on the database.

- All database procedures should be optimized.

Project Design

0.6   Methodology

The Software Development Lifecycle is composed of different types of models. Agile software development is a type of SDLC. This project Learning Management System is based on agile software development. The reason why we chose this model is because we can do changes in the web app with time according to the requirements. This methodology is the most suitable model for the project.

0.6.1   What is Agile Software Development?

The software developed in the agile software development is according to the requirements and specification provided by the user. The specifications are changed and improved with the time and the web app is made more flexible for the users.

0.6.2   Why we chose Agile Model?

The reason we selected this model for our web app, is because we had limited time for development of this project. The requirements for it were continuously changing according to the demand of the university. So, we worked on a limited requirements which were needed to start the project. We will continue to gather requirements and improve it with time according to the feedback of the university.
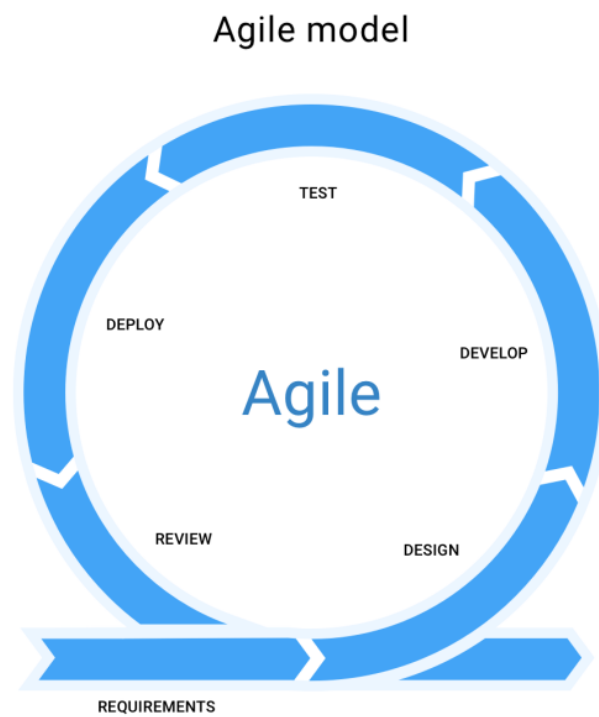
FIGURE 1: Agile Model Methodology

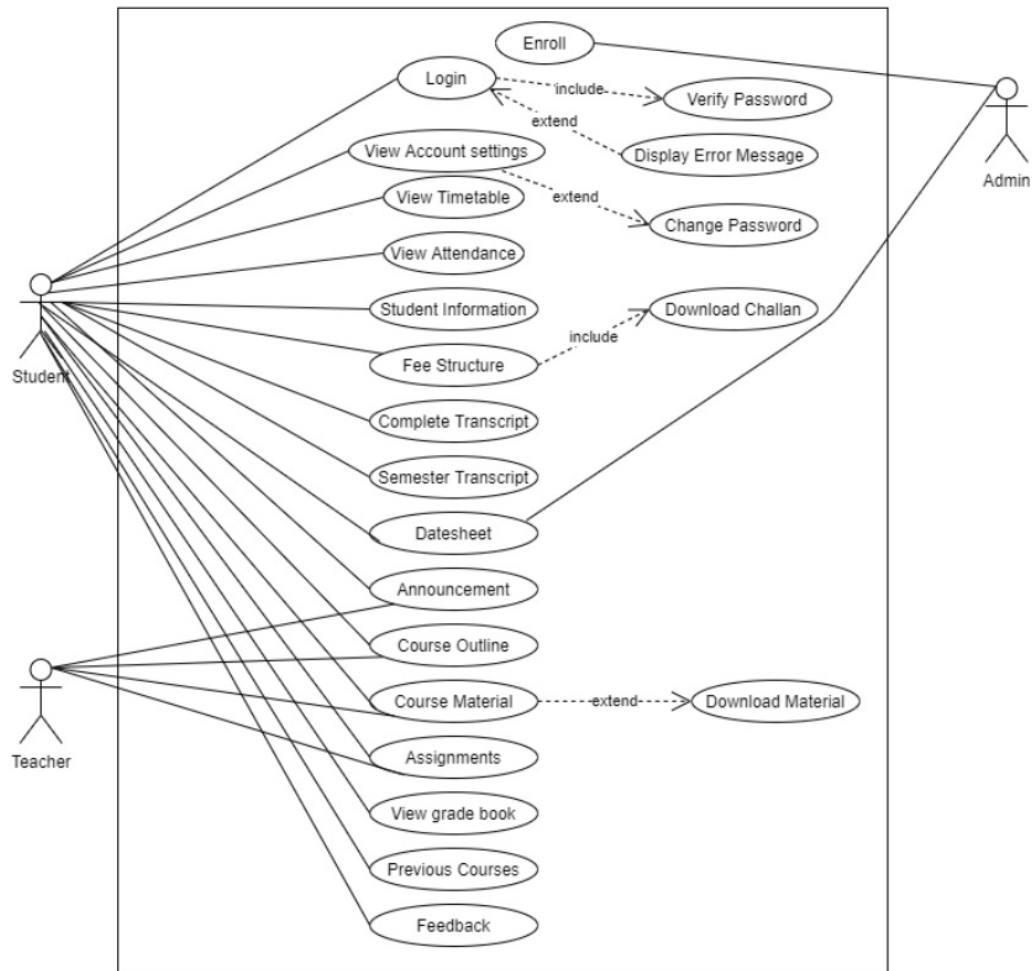# 0.7 Design Diagram Description

0.7.1 Use Case Diagram

FIGURE 2: Use-Case Diagram

0.7.2   Use-Case Descriptions

Use Case ID:	UC-1.1
Use Case Name:	Log In

Use Case History	Created By:
	  • Muhammad Ali Raza, Talha Ahmad Sahi
	Data Created:
	  14/10/2020
	Last Updated By:
	  • Muhammad Ali Raza, Talha Ahmad Sahi
	Date Last Updated:
	  14/10/2020

Actors:	Student
Description:	Student is able to login to use the functionality of the **"LMS"**.
Trigger:	Student accesses the login panel of web application by clicking on the **"Log In"** Button.
Preconditions:	1. Student must have a registered account.
Postconditions:	1. Student is logged in successfully. 2. System redirects Student to home page of application.
Normal Flow	1. Student opens the application. 2. Student enters his/her user name. 3. Student enters his/her password. 4. Student presses **"login"** button. 5.
Alternate Courses	None

Exceptions:	In step 4 of normal flow if student username or password is wrong:
	  1. System displays an error "Invalid username or Password".
	  2.

Assumptions:	1. Student has internet connection. 2. Student must have a registered account.

FIGURE 3: Use-Case 1

Use Case ID:	UC-1.6
Use Case Name:	Student Information
Use Case History	Created By: • Muhammad Ali Raza, Talha Ahmad Sahi Data Created: 14/10/2020 Last Updated By: • Muhammad Ali Raza, Talha Ahmad Sahi Date Last Updated: 14/10/2020
Actors:	Student
Description:	After successfully login to the system Student can see Profile Information of his/her account. Profile information can contain different things like student name, registration number etc.
Trigger:	Whenever Student click on "Student Information" Button Profile Information shows to the Student.
Preconditions:	1. Student must have a registered account 2. Student Login Successfully
Postconditions:	1. Student can view Profile Information of his/her account.
Normal Flow:	1. Student Login Successfully 2. Student can redirect to the Homepage 3. Student can click on Student information button. 4. Student can view his/her information.
Alternate Courses	None
Exceptions:	1. Some information may not be displayed
Assumptions:	The Student is using the system already and is a registered member of the system.

FIGURE 4: Use-Case 2

Use Case ID:	UC-1.7
Use Case Name:	Fees Structure
Use Case History	Created By: • Muhammad Ali Raza, Talha Ahmad Sahi Data Created: 14/10/2020 Last Updated By: • Muhammad Ali Raza, Talha Ahmad Sahi Date Last Updated: 14/10/2020
Actors:	Student
Description:	After successfully login to the system Student can see Fee Structure. It is also a big advantage for student to see his/her fees structure and student can also download fees challan. After submitting fees Student can also get confirmation on his portal of fees submission.
Trigger:	Whenever Student click on "Fees Structure" Button Fees Challan shows to the Student.
Preconditions:	1. Student must have a registered account 2. Student Login Successfully
Postconditions:	1. Student can view Fees Challan 2. Student Can download Fees Challan 3. Student can get confirmation from admin of fees submission on Portal.
Normal Flow:	1. Student Login Successfully 2. Student can redirect to the Homepage 3. Student Click on "**Student Services**". 4. Student Click on "**Fees Structure**". 5. Student can download "**Fees Challan**". 6. Student get confirmation from admin of Fees submission.
Alternate Courses	None
Exceptions:	1. Fee verification may take some time due to some system error.
Assumptions:	1. The Student is using the system already and is a registered member of the system. 2. For fees verification status student must have to pay fees.

FIGURE 5: Use-Case3

0.7.3 Activity Diagrams
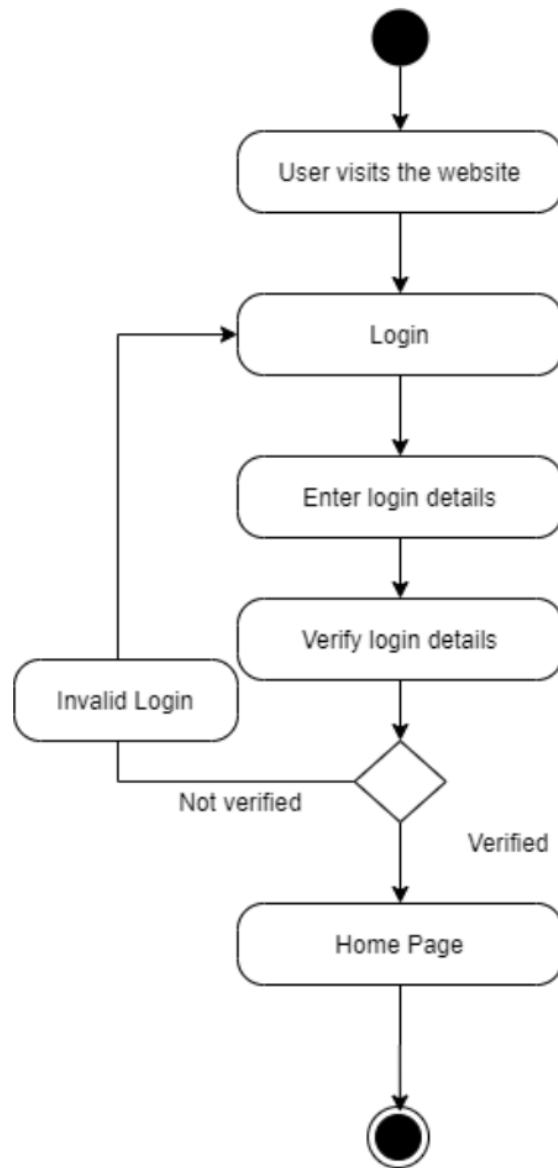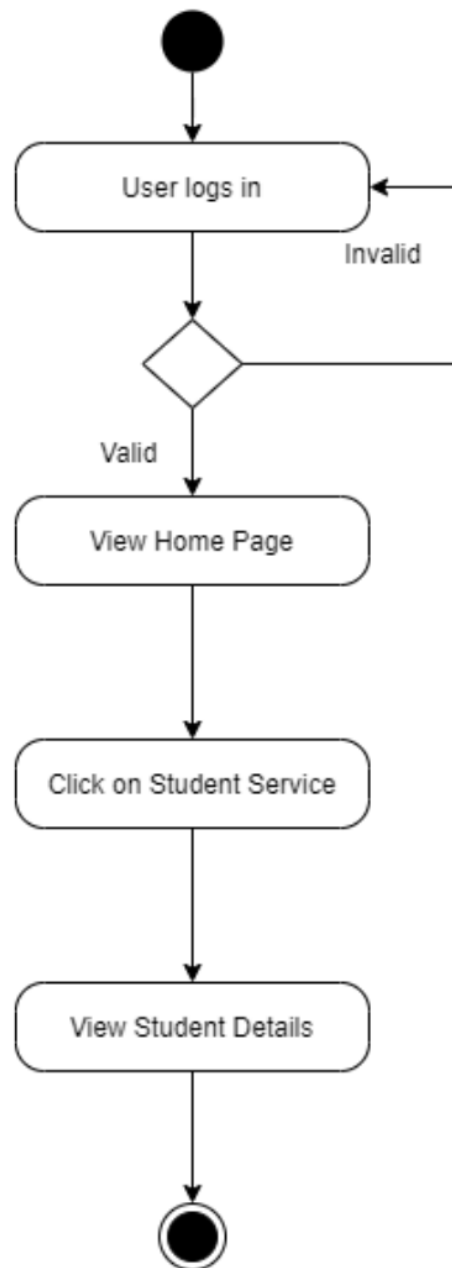

FIGURE 6: Login Activity Diagram
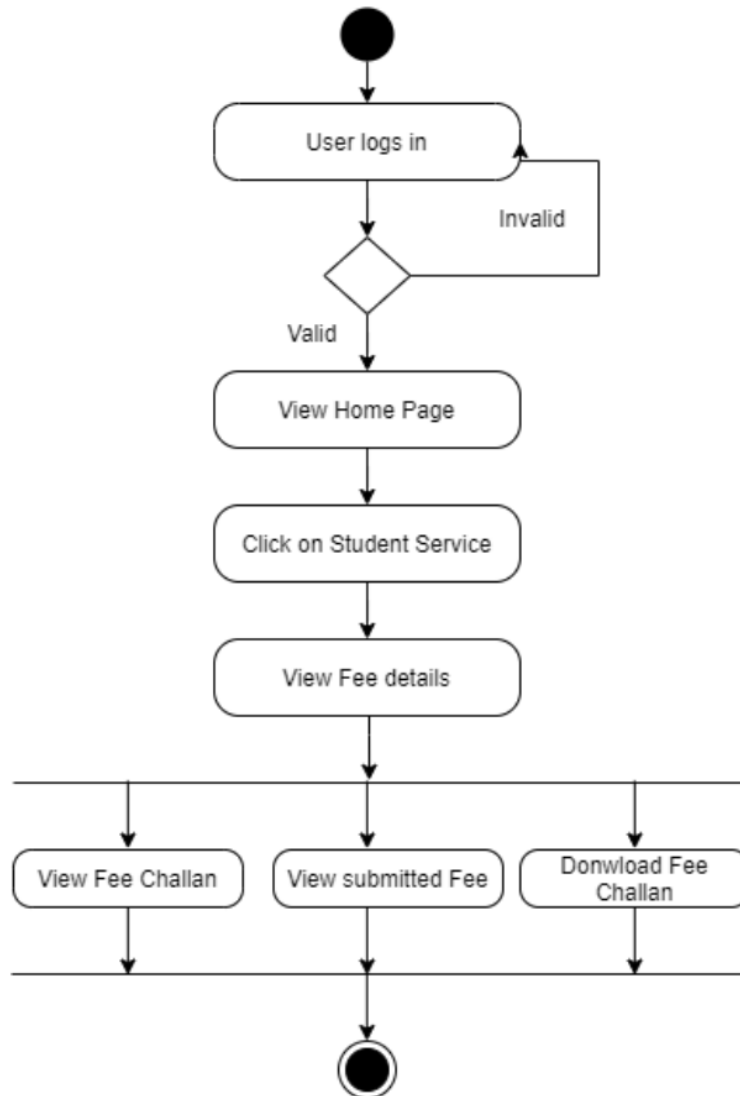
FIGURE 7: Student Details Activity Diagram

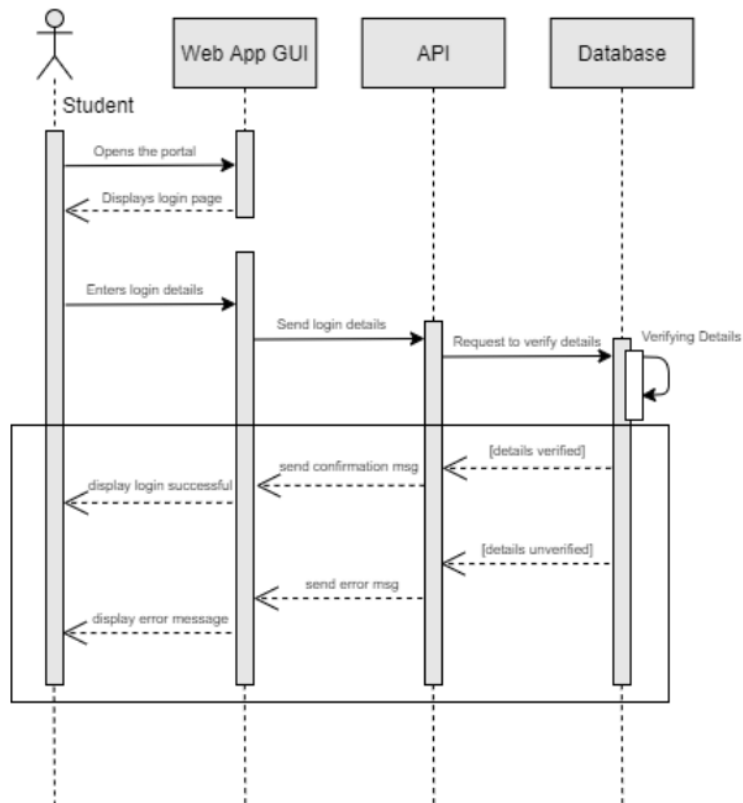FIGURE 8: Fee Challan Activity Diagram

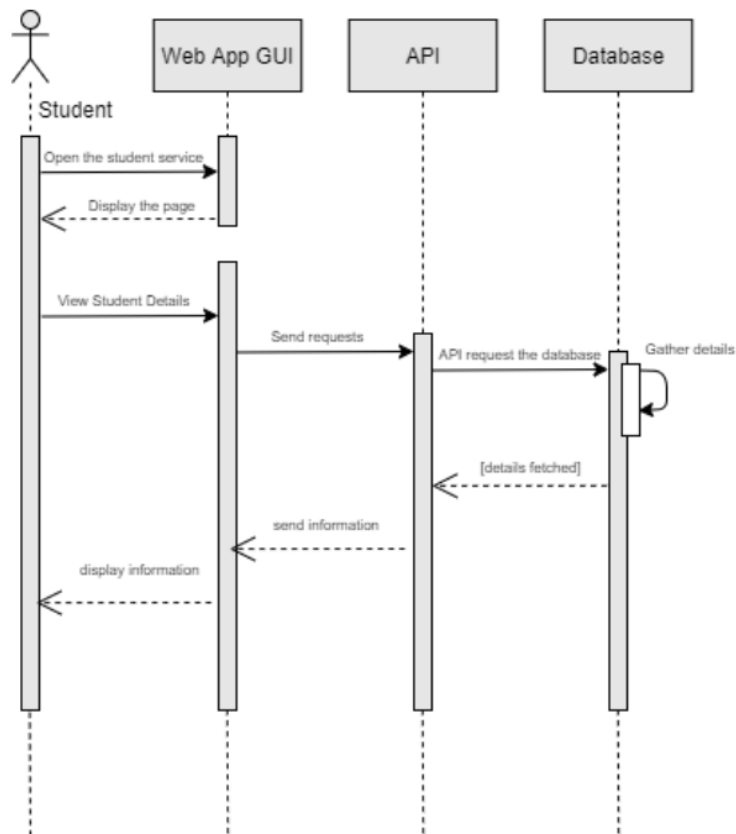## 0.7.4 Sequence Diagrams

FIGURE 9: Sequence Diagram: Login
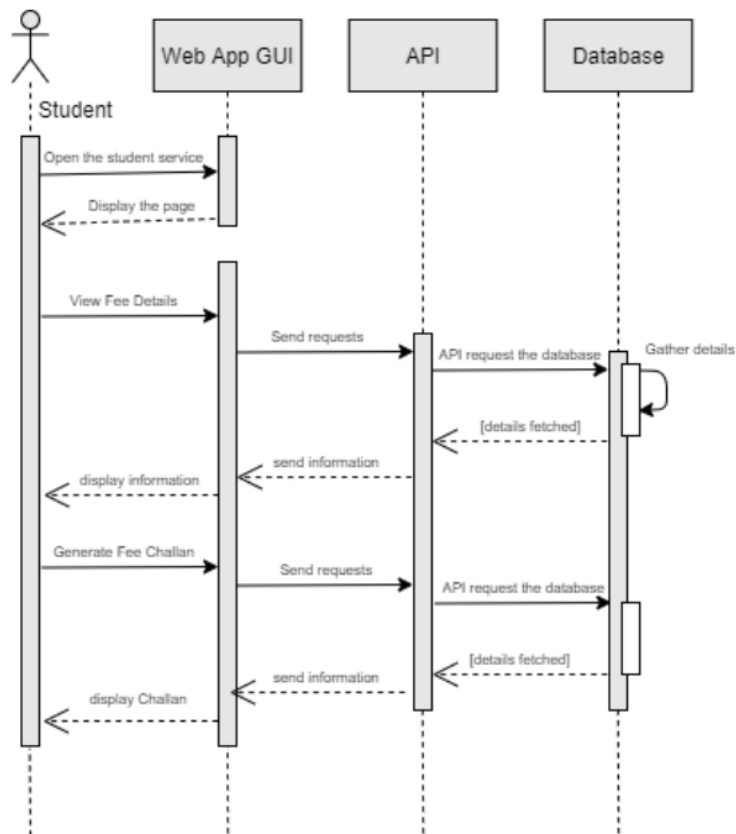
Figure 10: Sequence Diagram: Student Information

FIGURE 11: Sequence Diagram: Fee Challan

0.7.5 Entity Relationship Diagram
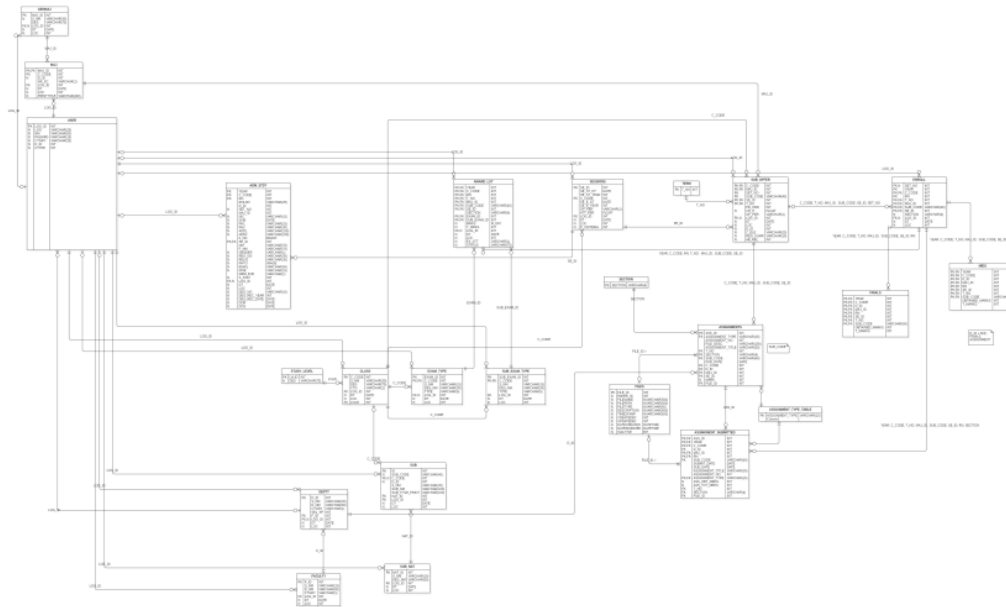
The ERD of the LMS:

FIGURE 12: The Entity Relationship Diagram

The ERD of the Fee Section:
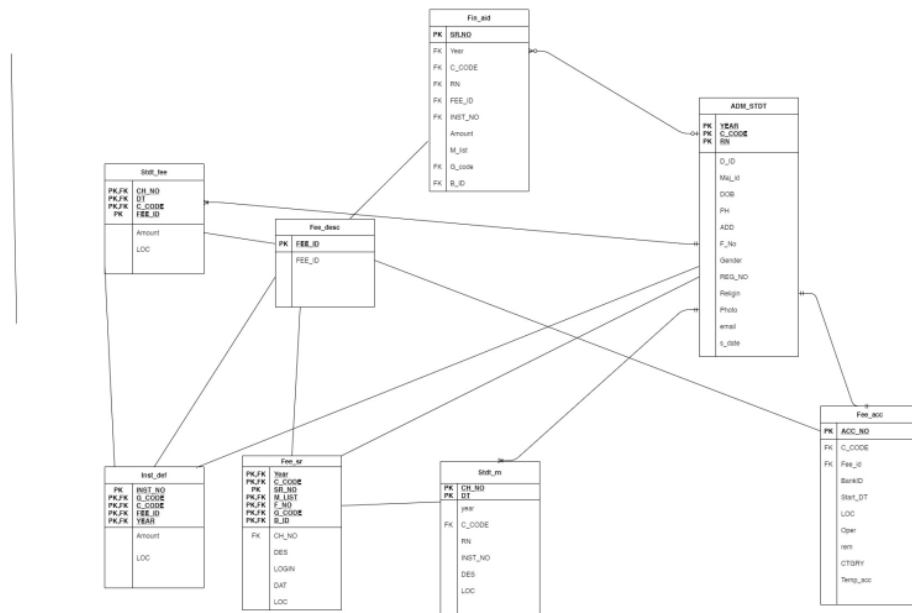
FIGURE 13: The Entity Relationship Diagram of Fee Section

Implementation and Evaluation

The learning management system is divided into three modules, frontend, API and the database server. The frontend is written using angular framework, the Application Programming Interface (API) is written in dot net framework and Microsoft SQL server is used as the database server.

0.8 Front end Development

The front end language for this project Learning Management system is angular. The reason we selected this framework is because of the two way binding that angular allows. It synchronizes model and the view. If either of them changes, so does the other. This thing reduced a lot of development time as it reduces the code to be written. There is no need to add any additional library to achieve the basic functionality of your project. The html and CSS are written in .html file while the business logic is implemented in the typescript file. This frontend is connected with the dot net API, which is now discussed below.

0.9   Application Programming Interface (API)
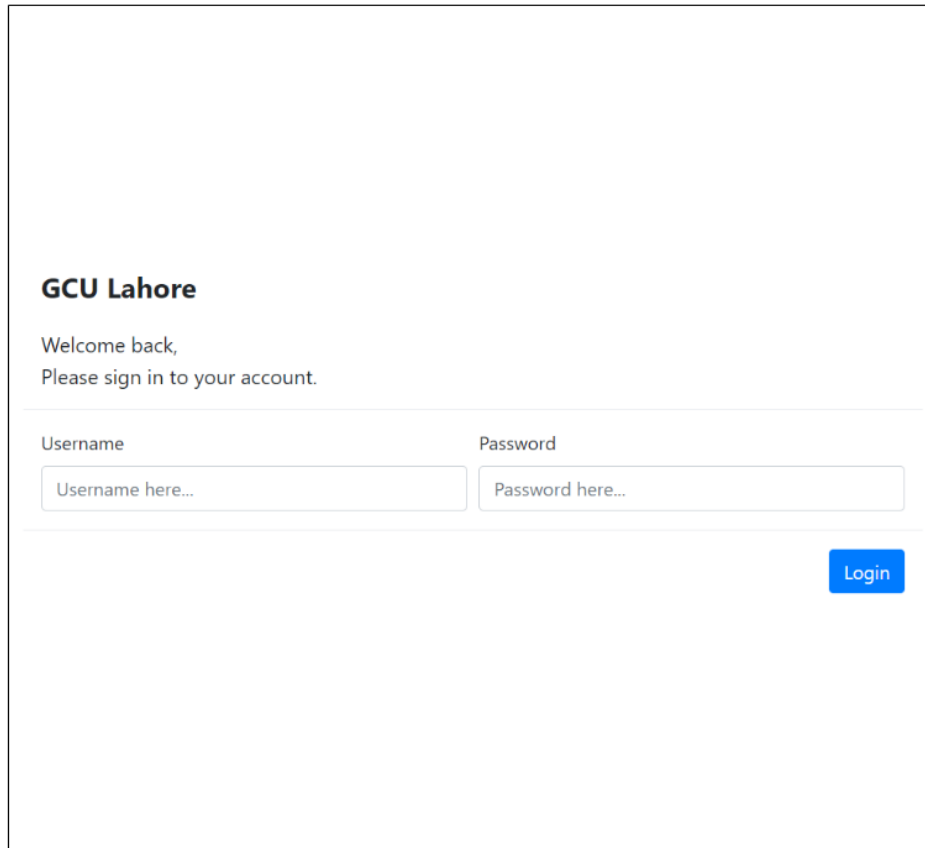
The API in this project is actually acting as bridge between the database server and the frontend. The language used is the C Sharp and the framework is dot net. Controller are written for each of database stored procedures that are called whenever there is any action performed on the frontend. The connection of API with the front end is implemented in the routing file in the angular directory.

0.10   Database Server

The LMS is using the latest Microsoft SQL server. For each of the process, displaying student information, calculating student result, generating fee challan and attendance. Data is fetched from the database using the stored procedures that are called by the API on the request of the frontend. The database has tables for all the data and it is retrieved using the stored procedures on the API request.

0.11   User Interface

- **Login Page:**   Showing the login screen.

FIGURE 14: Login Page

- **Home page:** Showing the home page of LMS.
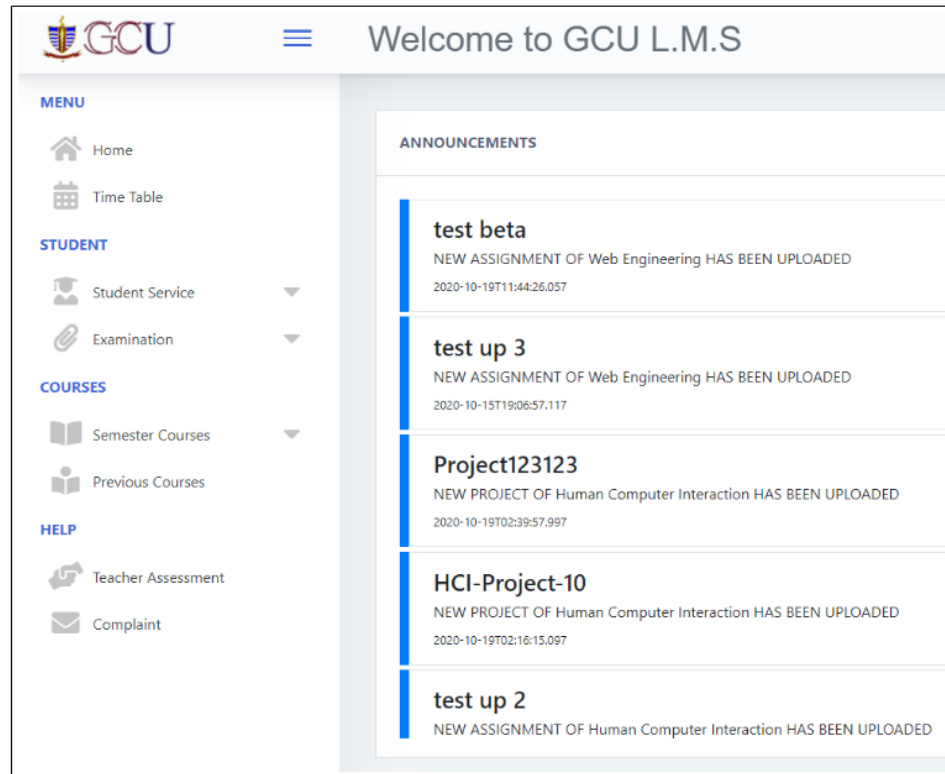
FIGURE 15: Home Page

- **Home Page2:** Showing the other part of home page.
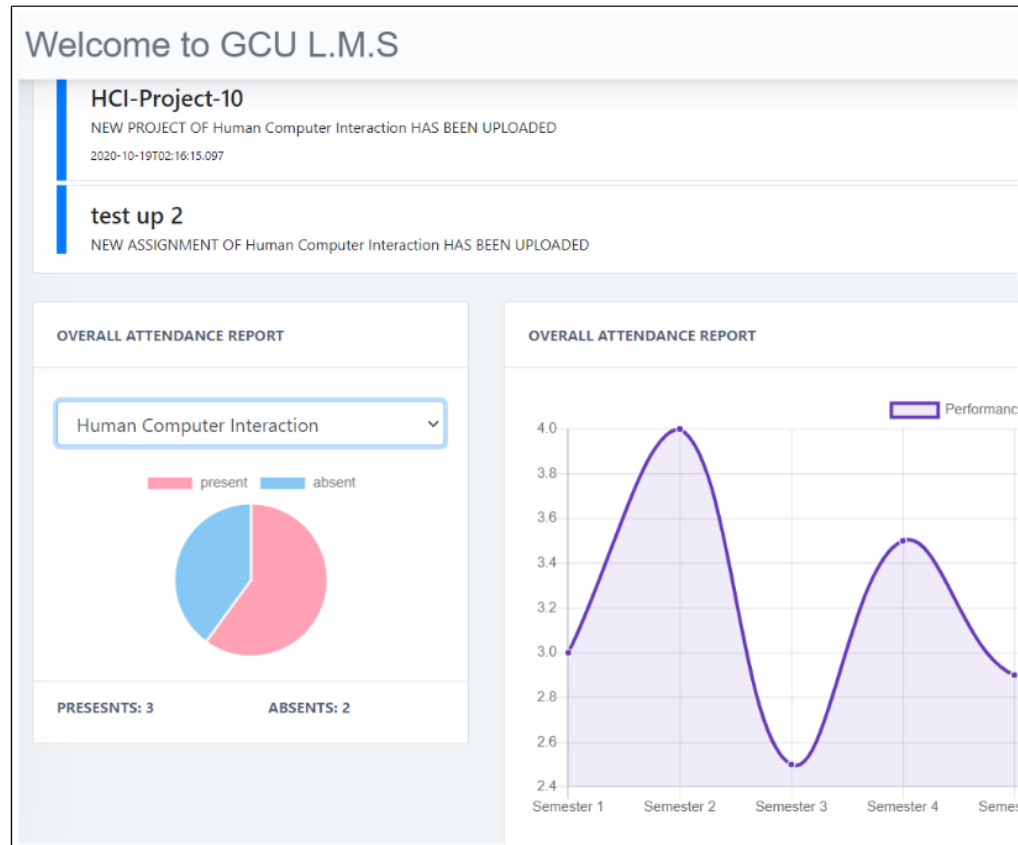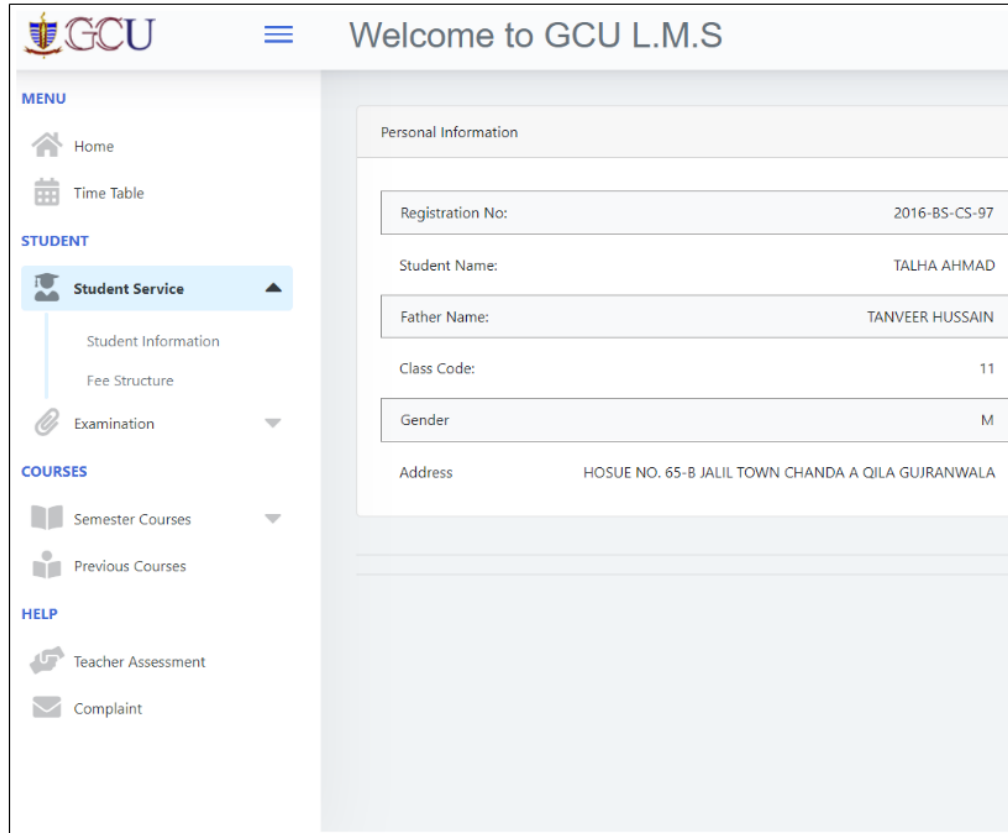

FIGURE 16: Home Page2

- **Student Information:** Showing personal infromation of student.

FIGURE 17: Student Information

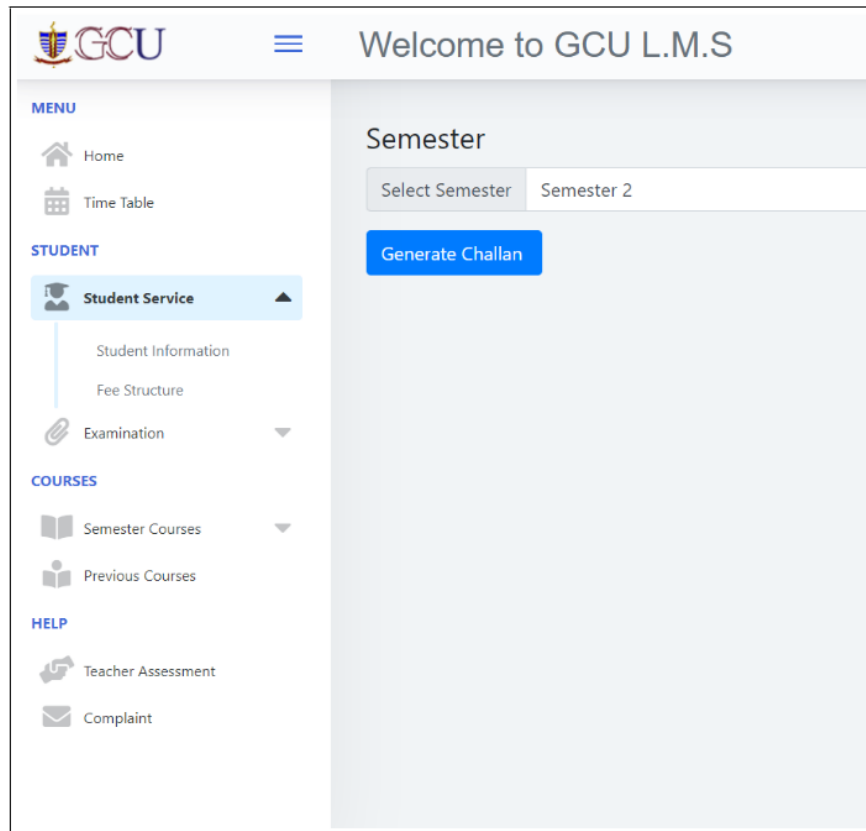- **Fee Structure:** Showing Menu of the Fee Structure to generate fee challan for the specified semester.

FIGURE 18: Fee Structure

- **Fee Challan:** Showing the generated Fee Challan.

FIGURE 19: Fee Challan

- **Fee Challan View:** Showing the view of Fee Challan.

FIGURE 20: Fee Challan View

- **Fee Challan View2:** Showing the view of Fee Challan2 (the remaining part of challan).

7. Other Misc.		0	7. Other Misc.			0
8. Lab Charged		0	8. Lab Charged			0
9. Miscellaneous Fee.		0	9. Miscellaneous Fee.			0
10. Development Fund		6300	10. Development Fund			6300
11. Sports Fee		700	11. Sports Fee			700
12. Verification Fee		0	12. Verification Fee			0
13. Other Misc.SPP		0	13. Other Misc.SPP			0
Total A	**4450-4**	**49000**	**Total A**	**4450-4**		**49000**
B-Funds			**B-Funds**			
01. Room Rent	2129-01	0	01. Room Rent	2129-01		0
02. Hostel Security	2127-01	0	02. Hostel Security	2127-01		0
03. Library Security	2128-01	0	03. Library Security	2128-01		0
04. Withholding Tax		0	04. Withholding Tax			0
05. Student Fund		0	05. Student Fund			0
06. Board Fee		0	06. Board Fee			0
Total B		**0**	**Total B**			**0**
Total (A + B)		**49000**	**Total (A + B)**			**49000**
Bank Charges		**0**	**Bank Charges**			**0**
Grand Total		**49000**	**Grand Total**			**49000**
Treasurer		**For Bank Name**	**Treasurer**			**For Bank Name**
G.C. University			**G.C. University**			
Lahore		**Manager**	**Lahore**			**Manager**
Printed by: G.C.U LMS			**Printed by: G.C.U LMS**			

FIGURE 21: Fee Challan View2

- **Downloaded Fee Challan:** The downloaded pdf of Fee Challan is opened, from here Student can print the challan.

FIGURE 22: Downloaded Fee Challan

- **Fee Challan for the Financial Aid Student:** Showing the Challan information for the student who is in the financial aid table.

FIGURE 23: Fee Challan for the Financial Aid Student

- **Fee Challan View of Financial Aid Student:**

Fee Must Be Paid Within Due Date			Fee Must Be Paid Within Due Date		
To be given to the depositor			To be given to the depositor		
Habib Bank Limited			**Habib Bank Limited**		
GC UNIVERSITY CAMPUS, LAHORE			GC UNIVERSITY CAMPUS, LAHORE		
Bank Challan No.		Due Date: 03-MAR-20	Bank Challan No.		Due Date: 03-MAR-20
Dues for:	Semester 3		Dues for:	Semester 3	
Roll No :	0010-BSCS-16		Roll No :	0010-BSCS-16	
Name :	MUHAMMAD ALI RAZA		Name :	MUHAMMAD ALI RAZA	
S/D of :	MUHAMMAD SARWAR		S/D of :	MUHAMMAD SARWAR	
Head of Account	**Account #**	**Amount**	**Head of Account**	**Account #**	**Amount**
A-Fees			**A-Fees**		
1. Admission Fee		0	1. Admission Fee		0
2. Registration Fee		0	2. Registration Fee		0
3. Tuition Fee		39000	3. Tuition Fee		39000
4. Examination Fee		0	4. Examination Fee		0
5. Thesis Fee		0	5. Thesis Fee		0
6. I.D Card		0	6. I.D Card		0
7. Other Misc.		0	7. Other Misc.		0
8. Lab Charged		0	8. Lab Charged		0
9. Miscellaneous Fee.		0	9. Miscellaneous Fee.		0
10. Development Fund		0	10. Development Fund		0
11. Sports Fee		0	11. Sports Fee		0
12. Verification Fee		0	12. Verification Fee		0
13. Other Misc.SPP		0	13. Other Misc.SPP		0
Total A	**4450-4**	**39000**	**Total A**	**4450-4**	**39000**

FIGURE 24: Fee Challan View of Financial Aid Student

0.12 Evaluation

Evaluation of the learning management system is the most important part. The code is this project is very well maintained and organized, it is properly divided into series of modules. If there is any error it is very easy to debug, and code can be recompiled again. The code is organized in such a way that each of the module if independent of other. So if there is any error in one modules the other ones are not disturbed. So it is very easy to evaluate and debug any error. The project has been evaluated considering these key points:

1. The collected requirements are determined and compared with the developed project. It is checked if project is completely developed according to the initial requirements.

2. The LMS is running perfectly with live database and there are no possible error.

3. The LMS is well maintained and frontend, API and SQL are working fine.

4. The developed LMS provides an easy way of debugging and solving error.

0.13 Functional Testing

Functional testing of this LMS is done by following test case given below:

- **Test Case 1:**

Test Case ID	Test-Case-01
Module Name	Login Student
Tested By	Talha Ahmad Sahi
Description	Login details should be provided to the student.
Steps to perform	Student needs to enter his roll number and the password provided by the university and click the login button
Expected Results	The student should be logged in to the LMS, see the successful login message at the top right of the screen and the home page should be displayed.
Pre-Condition	Student must already exist in the database, it must be created by the system admin, before the student tries to log in.
Status	PASS

FIGURE 25: Test Case 1

- Test Case 2:

Test Case ID	Test-Case-02
Module Name	Student Information
Tested By	Muhammad Ali Raza
Description	Student accesses his personal information
Steps to perform	After logging in the student should click on the student structure module and click the student information.
Expected Results	The student should see his completed personal details on the LMS.
Pre-Condition	Student must already exist in the database, he/she should have active internet connection it must be created by the system admin, before the student tries to log in.
Status	PASS

FIGURE 26: Test Case 2

- **Test Case 3:**

Test Case ID	Test-Case-03
Module Name	View Fee Challan
Tested By	Muhammad Ali Raza
Description	Student accesses his Fee details
Steps to perform	The student should click on the fee structure and choose the semester to view its challan.
Expected Results	The student should see the fee challan of the selected semester.
Pre-Condition	Student must be logged in and there should be sufficient data for his fee in the database.
Status	PASS

FIGURE 27: Test Case 3

- **Test Case 4:**

Test Case ID	Test-Case-04
Module Name	Download Fee Challan
Tested By	Muhammad Ali Raza
Description	Student downloads the fee challan.
Steps to perform	After viewing the fee challan, student should click on the download challan button.
Expected Results	Fee challan should be downloaded.
Pre-Condition	Student must be logged in and there should be enough data to generate the fee challan.
Status	PASS

FIGURE 28: Test Case 4

- **Test Case 5:**

Test Case ID	Test-Case-05
Module Name	Paid Fee
Tested By	Talha Ahmad Sahi
Description	Check if the student has paid the fee.
Steps to perform	Select the semester, and choosing the semester, student will see the total fee and the paid fee, it he/she has paid the fee, it will be shown.
Expected Results	Paid fee should be displayed.
Pre-Condition	Student must have paid the fee in order to generate the result.
Status	PASS

FIGURE 29: Test Case 5

• **Test Case 6:**

Test Case ID	Test-Case-06
Module Name	Fee Challan for Financial Aid
Tested By	Talha Ahmad Sahi
Description	Fee challan generation for financial aid student.
Steps to perform	The student should click on the fee structure and choose the semester to view its challan.
Expected Results	The student should see the fee challan of the selected semester.
Pre-Condition	Student must be logged in and there should be sufficient data for his fee in the database.
Status	PASS

FIGURE 30: Test Case 6

- **Final Results of Test Cases**

Test Case Name	Test Case ID	Testing Tool	Test Case Result
Test-Case-01	Test-Case-01	Manual	PASS
Login Student	Test-Case-02	Manual	PASS
Student Information	Test-Case-03	Manual	PASS
View Fee Challan	Test-Case-04	Manual	PASS
Download Fee Challan	Test-Case-05	Manual	PASS
Paid Fee	Test-Case-06	Manual	PASS

FIGURE 31: Final Results of Test Cases

Conclusion & Future Work

0.14   Conclusion

The Learning Management system is developed to facilitate the students and faculty of the Government College University Lahore. The LMS comprises of three tiers first one was the frontend which is done using the Angular framework, the backend API is on the dot net framework, whereas the database is on the Microsoft SQL Database server. The LMS provides an all in one solution to the university where all of the problems Students attendance, Courses Management, Fee Challan generation, Marks sheet generation are solved. All of these functionalities are coded properly and almost all of the major problem are solved. The whole LMS team worked together in the project to make the best of it. There was so much to learn, we learned how to manage stuff in shorter time limits and how to tackle different scenarios..

0.15 Future Plan

This was our first major project related to the development of web application on such a large scale with real data. This project is based on agile methodology, so it always has the room for new things to be added. So in the future we are looking forward to increase the performance of the database procedures, enhance the performance of the system and try to add some new modules like online classroom as this is one of the major demand during the current pandemic situation.

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