Final Project Report

AUTOMATED EXAMINATION SYSTEM

Project Supervisor
Neelam Alam

Submitted By

F1802AFF9F

Muhammad Omer Ahmed MC160202209

Software Projects & Research Section,
Department of Computer Sciences,
Virtual University of Pakistan

Certificate

This is to certify that Muhammad Omer Ahmed (MC160202209), has worked on and completed their Software Project at Software & Research Projects Section, Department of Computer Sciences, Virtual University of Pakistan in partial fulfilment of the requirement for the degree of Master's in Information Technology under my guidance and supervision.

In our opinion, it is satisfactory and up to the mark and therefore fulfils the requirements of Master's in Information Technology.

Supervisor / Internal Examiner

Neelam Alam
Supervisor,
Software Projects & Research Section,
Department of Computer Sciences
Virtual University of Pakistan

_____
(Signature)

External Examiner/Subject Specialist

<<External Supervisor Name>>

_____
(Signature)

Accepted By:

_____
(For office use)

Exordium

In the name of Allah, the Compassionate, the Merciful.

**Praise be to Allah, Lord of Creation,
The Compassionate, the Merciful,
King of Judgment-day!**

**You alone we worship, and to You alone, we pray for help,
Guide us to the straight path**

The path of those who You have favoured,

**Not of those who have incurred Your wrath,
Nor of those who have gone astray.**

Dedication

I dedicate this project to my parents.

Acknowledgement

I would like to share my gratitude to my final year project supervisor, Ms. Alam, whose contribution in stimulating suggestions and encouragement, helped me to coordinate my project especially in writing this report.

Preface

This report has been written in May 2019 in a two semesters project at the Virtual University of Pakistan under the supervision of Ms. Neelam Alam. And I would like to thank her for her guidance.

During the project, I have developed a ASP.net based web application for conducting online examination

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CHAPTER 1
Gathering & Analysing Info

1. Chapter 1: Gathering & Analysing Info

1.1. Introduction

Automated Examination system (AES) is designed to provide paperless examination system to provide efficient time and cost saving.

1.2. Purpose of the Document

The purpose of the document is to collect and analyse all the requirements intended for the development of Automated Exam System. It will exemplify the purpose and ample declaration for the development of the system. And explains the system constraints, interface and interactions with other internal and external applications if applicable.

1.2.1. Intended Audience

1.2.1.1. Types of Reader

Suggested readers for this document are Project Managers, Software developers and General Audience.

1.2.1.2. Technical Background Required

The reader should have domain knowledge (related to the management of the institute) to understand the technical aspects of the document.

1.3. The scope of the Product

The initial scope is to develop an automated examination system which will allow the end user to conduct the examination in a paperless environment to save the environment. The system should be capable of managing different students simultaneously for attempting the exam for different courses.
The system should manage three different types of users i.e. students, teachers and admin all of them have different tasks to perform on the system and are not allowed to coincide with others' rights. The student can register their self, generate roll number slips, attempt quizzes, exams and assignments, teacher can mark the results and admin can perform all other tasks including adding courses, adding programmes, add assignments, quizzes and exams, generating different reports.

The system should be capable of managing records, results and data and through RDLC the user can generate reports. The system should manage quizzes, exams and assignments.

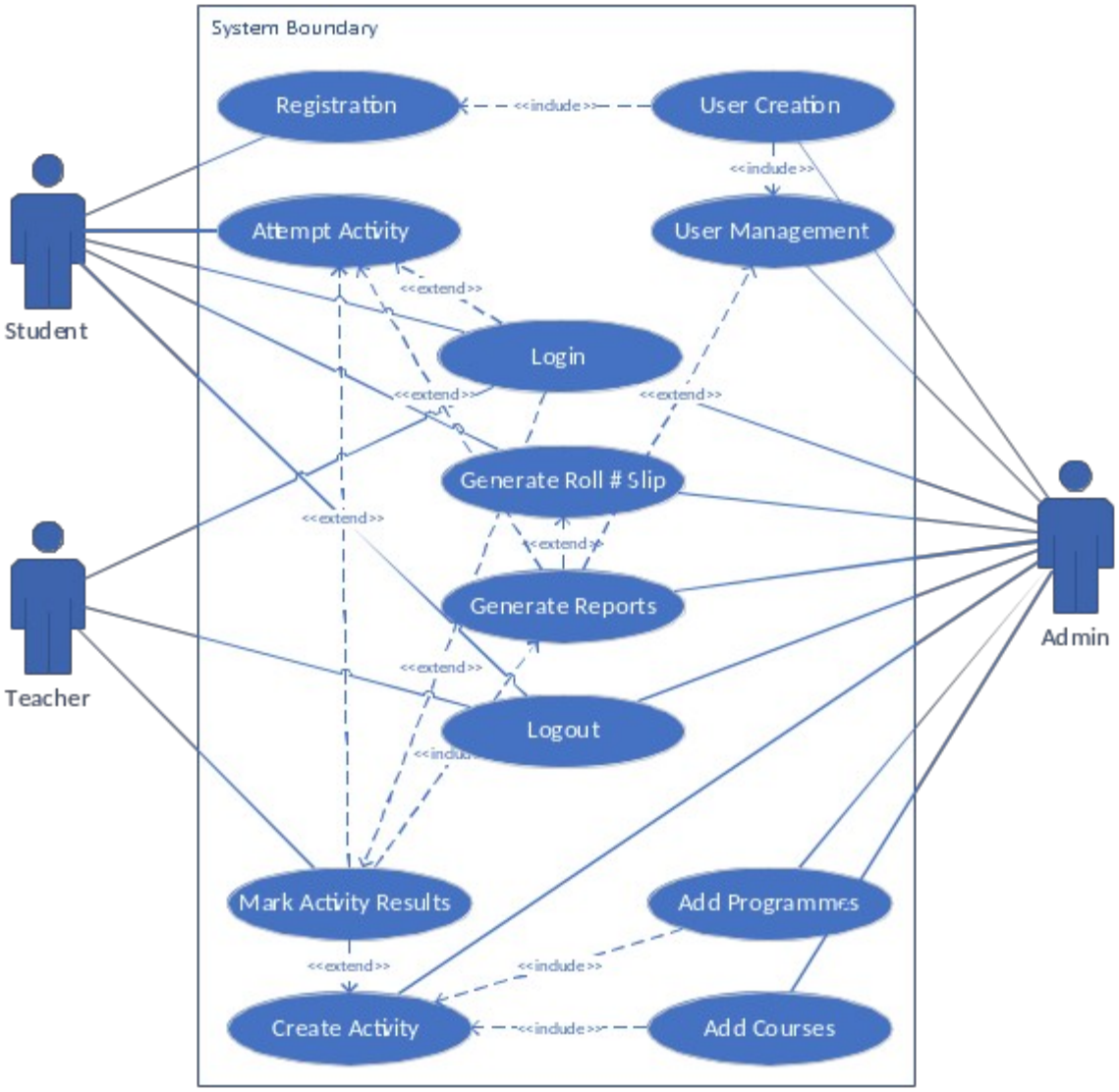
1.4. Definitions, Acronyms and Abbreviations

Term	Definition
AES	Automated Examination System
Student	A person who has been allowed to attempt the exam
Teacher	A person who has been allowed to mark the exams
Admin	A person who has been authorised to control the entire system
Web portal	A web-based application which will facilitate the end user
Stakeholder	Any person who has direct or indirect interaction with the system and is not a developer
Activity	Will be referred to any quiz, examination and/or assignment conducted

Table 1 - Definitions

1.5. Use Cases and Usage Scenarios

1.5.1. Use Case Diagram



2. *Figure 1 - Use case diagram AES*

1.5.2. Usage Scenarios

1.5.2.1. Usage Scenario 1: Registration

Use Case Title	**Registration**	
Use Case Id	US1	
Description: The end user i.e. Student will be able to create their users for the system to access their corresponding activities. When a student gets registered their user type will be set to Student by default.		
Pre-Conditions: A modern web browser application with internet access will be required to get registered.		
Task Sequence		**Exceptions**
1. Open AES application		
2. Click on Register		
3. Enter required credentials		
4. Click the submit button		
Post Conditions: Student will be able to use the application for the intended purposes		
Unresolved issues: N/A		
Authority: Student		
Modification history: **Author:** MC160202209 **Description:**		

1.5.2.2. Usage Scenario 2: User Creation

Use Case Title	**User Creation**
Use Case Id	US2
Description: The end user i.e. Admin will be able to create users for the system to access their corresponding activities. Admin will be able to create both Student and Teacher type users and will set their type.	
Pre-Conditions: A modern web browser application with internet access will be required to get access to the system. An admin login created at the time of development.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with Admin ID	
3. Enter User management	
4. Click create user	
5. Enter user credentials	
6. Select user type	
7. Click the submit button	
Post Conditions: Any user created will be able to use the application for the intended purposes	
Unresolved issues: N/A	
Authority: Admin	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.3. Usage Scenario 3: Login

Use Case Title	**Login**
Use Case Id	US3
Description: The end user i.e. Student, Teacher and Admin will be able to access the system after entering assigned username and password in to the application.	
Pre-Conditions: A modern web browser application with internet access will be required to get access to the system.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided username and password	
3. Perform designated operations	
4. Click the logout button to logout the system	
Post Conditions: Users will now be able to use the application for the intended purposes	
Unresolved issues: N/A	
Authority: Student, Teacher, Admin	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.4. Usage Scenario 4: Add Programmes

Use Case Title	**Add Programmes**
Use Case Id	US4
Description: The admin will create at least one programme to make the application workable. The programme will work as a container for courses.	
Pre-Conditions: A modern web browser application with internet access will be required to get access to the system. An admin account is required to add programmes.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided admin username and password	
3. Open programme management	
4. Click the add button	
5. Enter programme name, programme level, category	
6. Click the save button	
7. Repeat the process as many times as required	
Post Conditions: Admin will now be able to add courses in the application.	
Unresolved issues: N/A	
Authority: Admin	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.5. Usage Scenario 5: Add Courses

Use Case Title	**Add Courses**	
Use Case Id	US5	
Description: The admin will add at least one course to make the application workable for student to attempt quizzes/exams. Admin will select the programme and add the relevant course.		
Pre-Conditions: At least one programme must be defined prior to the addition of a course.		
Task Sequence		**Exceptions**
1. Open AES application		
2. Login in with provided admin username and password		
3. Open course management		
4. Click the add button		
5. Select relevant programme name		
6. Enter course details i.e. Title, Credit Hours		
7. Click the save button		
8. Repeat the process as many times as required		
Post Conditions: Admin will now be able to add different activities in the application.		
Unresolved issues: N/A		
Authority: Admin		
Modification history: **Author:** MC160202209 **Description:**		

1.5.2.6. Usage Scenario 6: Create Activity

Use Case Title	**Create Activity**
Use Case Id	US6
Description: The admin will now add an activity against the relevant course. The activity may consist of a quiz, exam and/or assignment.	
Pre-Conditions: At least one course must be defined prior to the addition of an activity.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided admin username and password	
3. Open activity management	
4. Click the add button	
5. Select relevant activity type i.e. Quiz, Examination, Assignment	
6. Enter activity details i.e. Questionnaire, MCQs, Descriptive etc.	
7. Click the save button	
8. Repeat the process as many times as required	
Post Conditions: Students will now be able to attempt the activities and teachers will be able to mark them.	
Unresolved issues: N/A	
Authority: Admin	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.7. Usage Scenario 7: Attempt Activity

Use Case Title	**Attempt Activity**
Use Case Id	US7
Description: The student will attempt the given activity provided and set by the admin. The student must submit the task to get the results.	
Pre-Conditions: At least one activity must be defined, and the system should have at least one user with type Student.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided student username and password	
3. Click Start the Activity (quiz, exam, assignment)	
4. If it's a quiz or exam system will start a timer and student will answer the questions asked otherwise for assignments the user need to submit the assignment.	
5. Click the Next button after every answer	Not applicable on assignments
6. Click the Finish button at the end of the activity	
Post Conditions: Admin will now be able to add different activities in the application.	
Unresolved issues: N/A	
Authority: Student	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.8. Usage Scenario 8: Mark Activity Result

Use Case Title	**Mark Activity Result**
Use Case Id	US8
Description: The teacher will mark the attempt activity provided and set by the admin. The teacher must check the task to get the results of the students.	
Pre-Conditions: At least one activity must be defined, and the system should have at least one user with type Student.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided teacher username and password	
3. Click the Activities (quiz, exam, assignment)	
4. If any assigned activity by the admin is available, it will be visible to the teacher for marking	
5. Open the activity	
6. Mark the activity accordingly	
7. Click the Finish button	
8. For each student the activities will be listed and can be checked one after another	
Post Conditions: Admin now be able to compile the results of the students	
Unresolved issues: N/A	
Authority: Teacher	
Modification history: **Author:** MC160202209 **Description:**	

1.5.2.9. Usage Scenario 9: Generate Reports

Use Case Title	**Generate Reports**	
Use Case Id	US9	
Description: After the task marking the system will calculate the results based upon VU CGPA system and allow the admin to generate the results' reports using RDLC.		
Pre-Conditions: The students must have attempted the activity and the teacher have marked it for result generation.		
Task Sequence		**Exceptions**
1. Open AES application		
2. Login in with provided admin username and password		
3. Click on the Report section		
4. Click on generate results		
5. The system will generate the report in desired format		
Post Conditions: Student now can see their results published by the admin		
Unresolved issues: N/A		
Authority: Admin		
Modification history: **Author:** MC160202209 **Description:**		

1.5.2.10. Usage Scenario 10: Generate Roll # Slip

Use Case Title	**Generate Roll # Slip**
Use Case Id	US10
Description: After student's registration the admin will be able to generate roll number slips for them to conduct the activity.	
Pre-Conditions: The students must have been registered in the system.	
Task Sequence	**Exceptions**
1. Open AES application	
2. Login in with provided admin username and password	
3. Click on the Report section	
4. Click on generate roll number slips	
5. The system will generate the report in desired format	
Post Conditions: Student now be able to use the system	
Unresolved issues: N/A	
Authority: Admin	
Modification history: **Author:** MC160202209 **Description:**	

1.6. Supplementary Requirements

1.6.1. Usability

The new system will have an interface that shares some feel of the old system so that users who are familiar with the old system will not have trouble adjusting to the new system.

1.6.2. Reliability

The system should be available 99% of the time and should be secured using SSL certificates (if client provides the appropriate funds).

1.6.3. Supportability

Since the application is web browser dependent it will work flawlessly on the following web browsers

- Mozilla Firefox 50+
- Firefox Quantum
- Google Chrome 50+
- Microsoft Edge

1.6.4. System Requirements

The application itself does not require any specific hardware but a minimum requirement to run the web browsers as follows

For Mozilla Firefox/Firefox Quantum/Google Chrome

- Windows 7
- Core 2 Duo processor
- RAM 2 GB
- HDD 40 GB

For Microsoft Edge

- Windows 10
- Core i3 processor
- RAM 4 GB
- HDD 100 GB

CHAPTER 2
Planning the Project

2. Chapter 2: Planning the Project

2.1. Introduction

The planning phase includes the translation of the requirements into a more sensible for with reference to software development. This clarifies the scope and vision of the client in details technically which helps the project manager to allocate resources and plan project execution using a predefined software project development model.

2.2. Methodology

A project methodology may infer as the process(es) adapted to complete the project. It gives the life cycle and the estimation of the project development timeline.

2.3. Available Methodologies

There are several methodologies available in the software project management with their own pros and cons.

2.3.1. Rapid Application Development

Rapid application development is a form of Agile software development methodology. Unlike Waterfall methods, RAD emphasizes working software and user feedback over strict planning and requirements recording.[CITATION cap19 \l 2057]

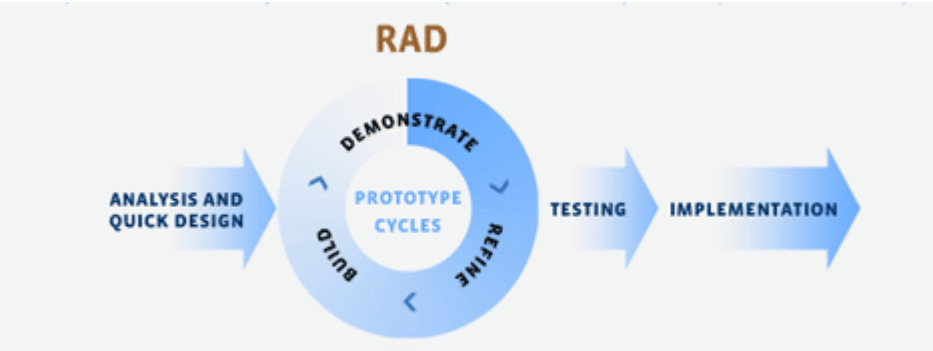


Figure 2 - Rapid Application Development

2.3.2. Scrum

Scrum is an agile way to manage a project, usually software development. Agile software development with Scrum is often perceived as a methodology; but rather than viewing Scrum as methodology, think

of it as a framework for managing a process.[CITATION mou19 \l 2057]

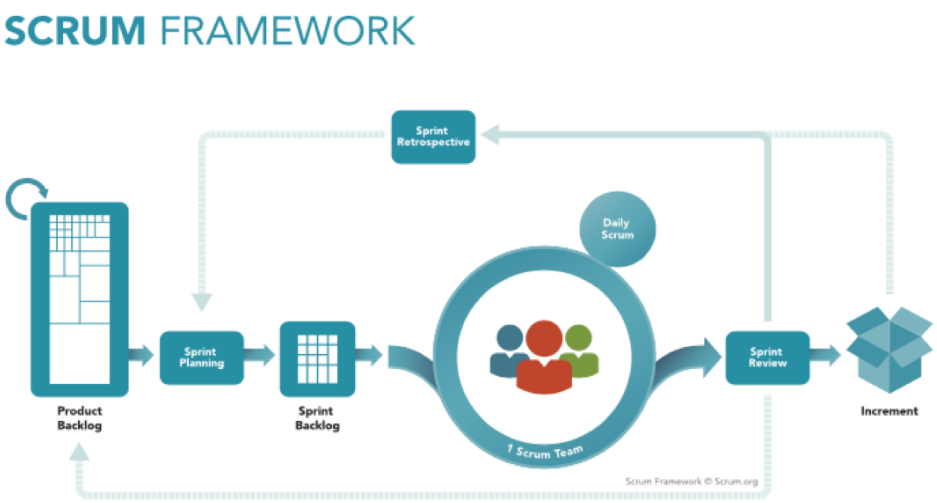


Figure 3 - Scrum Model

2.3.3. Incremental Model

Incremental Model is a process of software development where requirements are broken down into multiple standalone modules of software development cycle. Incremental development is done in steps from analysis design, implementation, testing/verification, maintenance. [CITATION Gur19 \l 2057]

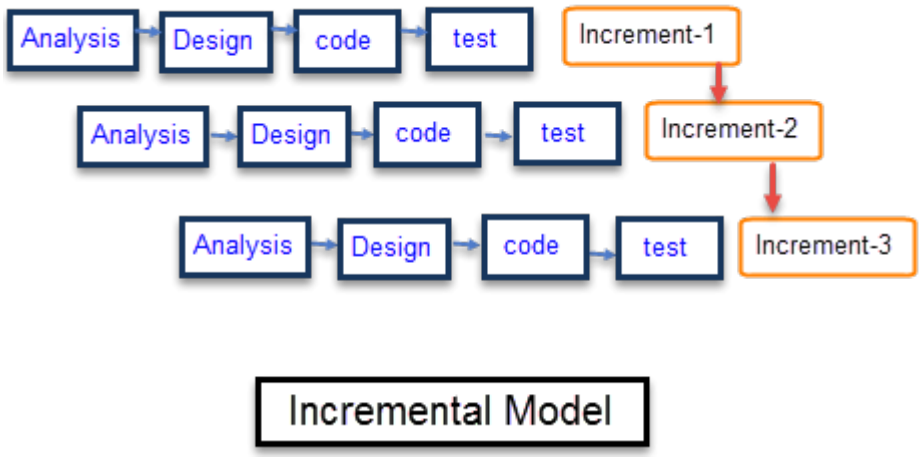


Figure 4 - Incremental Model

2.4. Chosen Methodology

The adopted methodology for application development is VU process model which is a fusion between Waterfall and the Spiral models. However, before getting into VU process model let's check the waterfall and spiral models to get a better understanding of the process.

2.4.1. Waterfall Model

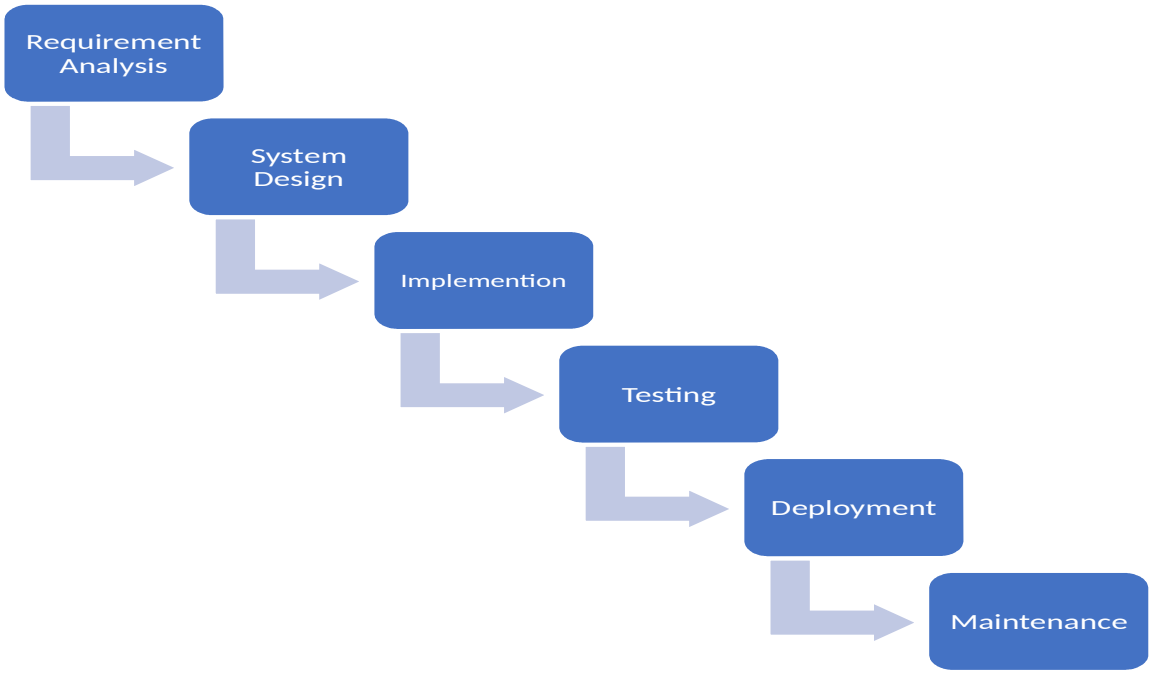


Figure 5 - Waterfall model

2.4.1.1. Requirement Analysis

The very first step in waterfall model is to gather the requirements by meeting the client/user of the application. It is very important to understand the needs of the client.

2.4.1.2. System Design

The design phase defines the overall system architecture along with the system hardware and software requirements.

2.4.1.3. Implementation

The development of the system will take place fulfilling all the requirements requested by the client. The approach maybe modular or as per the application size.

2.4.1.4. Testing

The testing of the application starts immediately after the development starts from unit testing to UAT. The purpose of this step is to eliminate all the errors during and after the development of the system.

2.4.1.5. Deployment

After the development and testing the system is now in deployment phase where the application is implemented in real environment.

2.4.1.6. Maintenance

In this phase the team ensures the system is up and running and if any issue persists the team will inform the testing and development teams.

2.4.2. Spiral Model

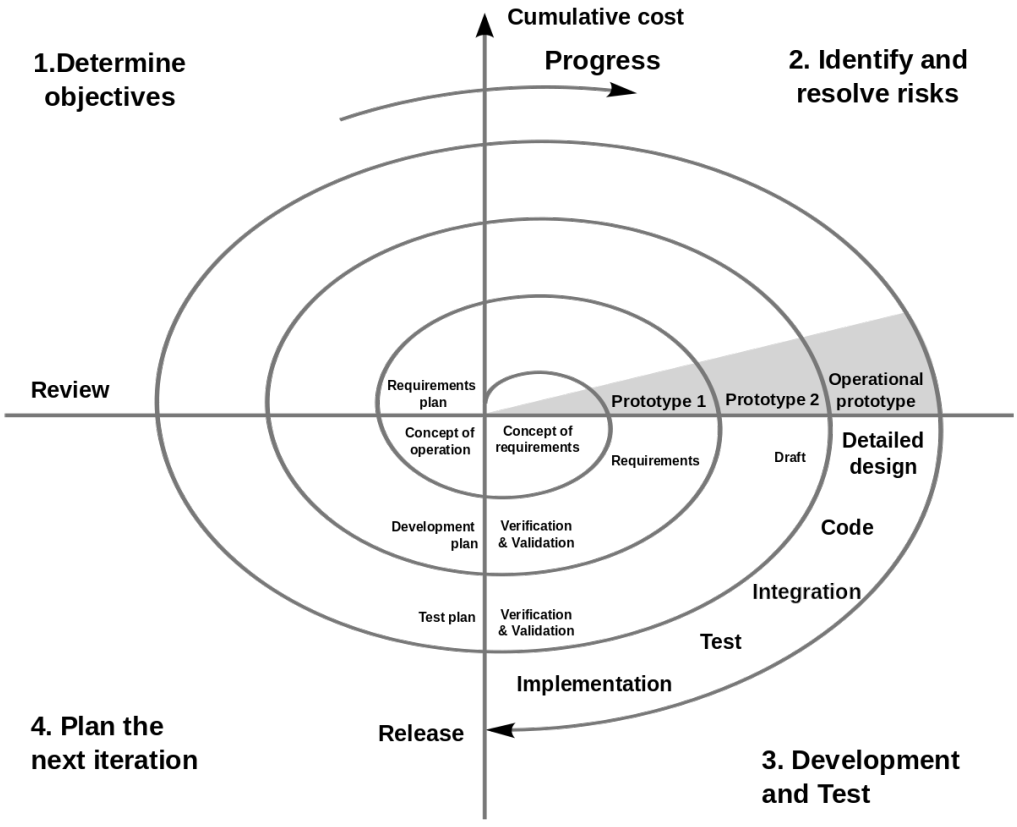


Figure 6 - Spiral Model

It consists of four phases objectives, identification, development and testing, and next iteration. This model is valid for large scale development and is highly expensive due to its nature in terms of time and money both.

2.4.3. VU Process Model

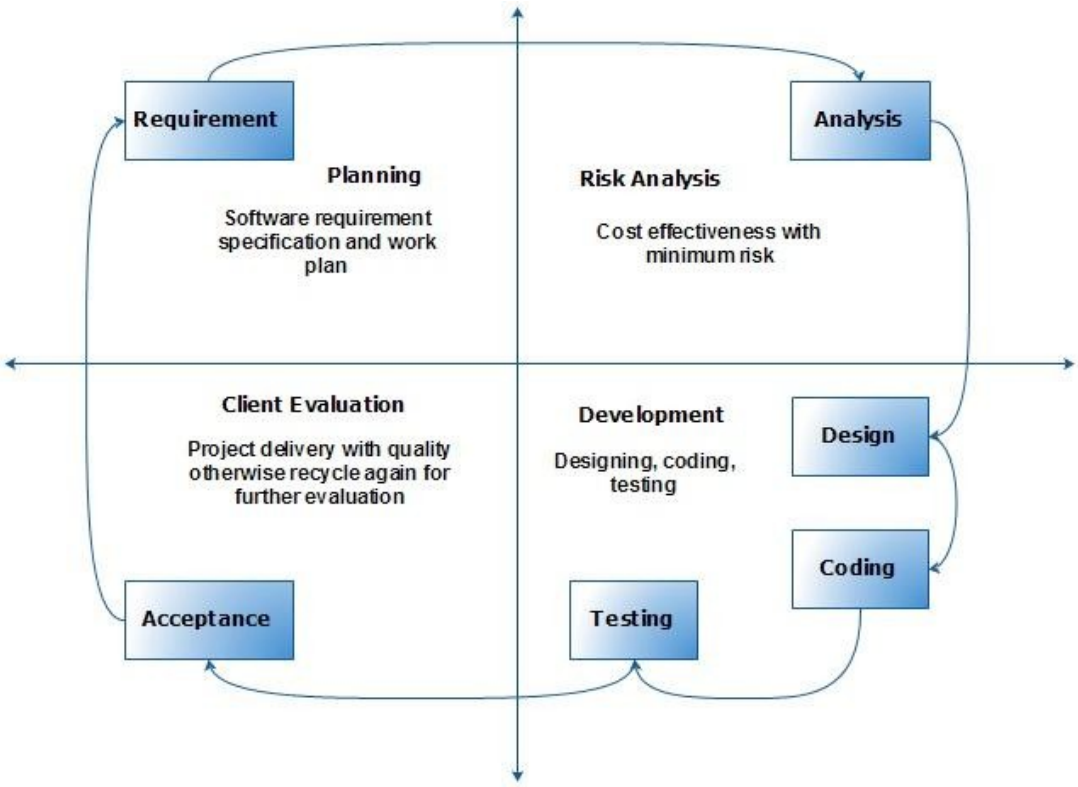


Figure 7 - VU Process Model

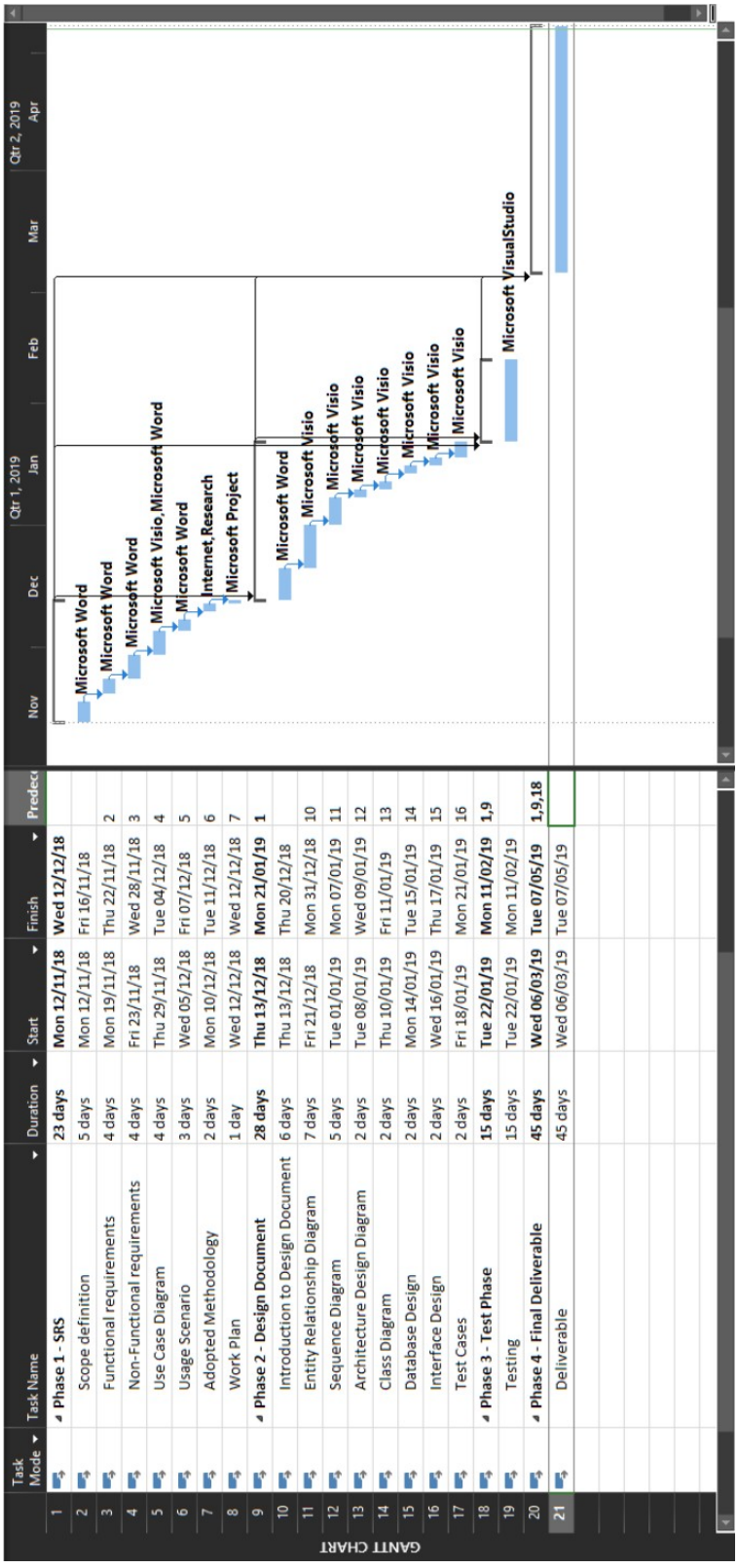
Here are a few benefits of choosing VU process model

- Iterative in nature
- A sequential model
- Easy to implement
- Rapid development
- Easy to track the record of the application phases
- Cost effective

2.5. Reasons for Chosen Methodology

Since it was instructed by the university to follow the UV process model that is why I have selected it as it has features of both spiral and waterfall model.

2.6. Work Plan



	Task Mode	Task Name	Duration	Start	Finish	Predec
1		**Phase 1 - SRS**	**23 days**	**Mon 12/11/18**	**Wed 12/12/18**	
2		Scope definition	5 days	Mon 12/11/18	Fri 16/11/18	
3		Functional requirements	4 days	Mon 19/11/18	Thu 22/11/18	2
4		Non-Functional requirements	4 days	Fri 23/11/18	Wed 28/11/18	3
5		Use Case Diagram	4 days	Thu 29/11/18	Tue 04/12/18	4
6		Usage Scenario	3 days	Wed 05/12/18	Fri 07/12/18	5
7		Adopted Methodology	2 days	Mon 10/12/18	Tue 11/12/18	6
8		Work Plan	1 day	Wed 12/12/18	Wed 12/12/18	7
9		**Phase 2 - Design Document**	**28 days**	**Thu 13/12/18**	**Mon 21/01/19**	**1**
10		Introduction to Design Document	6 days	Thu 13/12/18	Thu 20/12/18	
11		Entity Relationship Diagram	7 days	Fri 21/12/18	Mon 31/12/18	10
12		Sequence Diagram	5 days	Tue 01/01/19	Mon 07/01/19	11
13		Architecture Design Diagram	2 days	Tue 08/01/19	Wed 09/01/19	12
14		Class Diagram	2 days	Thu 10/01/19	Fri 11/01/19	13
15		Database Design	2 days	Mon 14/01/19	Tue 15/01/19	14
16		Interface Design	2 days	Wed 16/01/19	Thu 17/01/19	15
17		Test Cases	2 days	Fri 18/01/19	Mon 21/01/19	16
18		**Phase 3 - Test Phase**	**15 days**	**Tue 22/01/19**	**Mon 11/02/19**	**1,9**
19		Testing	15 days	Tue 22/01/19	Mon 11/02/19	
20		**Phase 4 - Final Deliverable**	**45 days**	**Wed 06/03/19**	**Tue 07/05/19**	**1,9,18**
21		Deliverable	45 days	Wed 06/03/19	Tue 07/05/19	

Figure 8 - Gantt Chart

2.7. Project Structure

2.7.1. Team Structure

I have worked on this project all alone

VU ID: MC160202209

Name: Muhammad Omer Ahmed

2.7.2. Project Schedule (Submission Chart)

Previously shared in Work Plan.

CHAPTER 3
Designing the Project

3. Chapter 3: Designing the Project

3.1. Introduction

The designing phase contains the technical illustrations of the application to be developed. This may contain architectural diagrams, BPMN, flowcharts etc. the reason of the illustration is to get the exact technical analysis of the vague image of the application in the client's mind.

3.2. Purpose

The purpose of the document is to collect and analyse all the requirements intended for the development of Automated Exam System. It will exemplify the purpose and ample declaration for the development of the system. And explains the system constraints, interface and interactions with other internal and external applications if applicable.

3.3. Scope

The initial scope is to develop an automated examination system which will allow the end user to conduct the examination in a paperless environment to save the environment. The system should be capable of managing different students simultaneously for attempting the exam for different courses.

The system should manage three different types of users i.e. students, teachers and admin all of them have different tasks to perform on the system and are not allowed to coincide with others' rights. The student can register their self, generate roll number slips, attempt quizzes, exams and assignments, teacher can mark the results and admin can perform all other tasks including adding courses, adding programmes, add assignments, quizzes and exams, generating different reports.

The system should be capable of managing records, results and data and through RDLC the user can generate reports. The system should manage quizzes, exams and assignments.

3.4. Definitions, acronyms and abbreviations

Term	Definition
AES	Automated Examination System
Student	A person who has been allowed to attempt the exam
Teacher	A person who has been allowed to mark the exams
Admin	A person who has been authorised to control the entire system

Web portal	A web-based application which will facilitate the end user
Stakeholder	Any person who has direct or indirect interaction with the system and is not a developer
Activity	Will be referred to any quiz, examination and/or assignment conducted

3.5. Architectural Representation (Architecture Diagram)

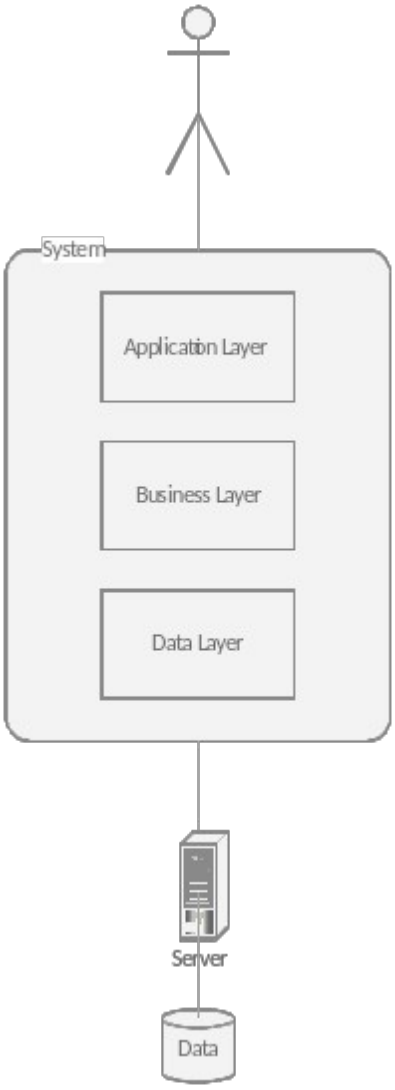


Figure 9 - Architectural Diagram

3.6. Dynamic Model: Sequence Diagrams

3.6.1. SD-1: Registration

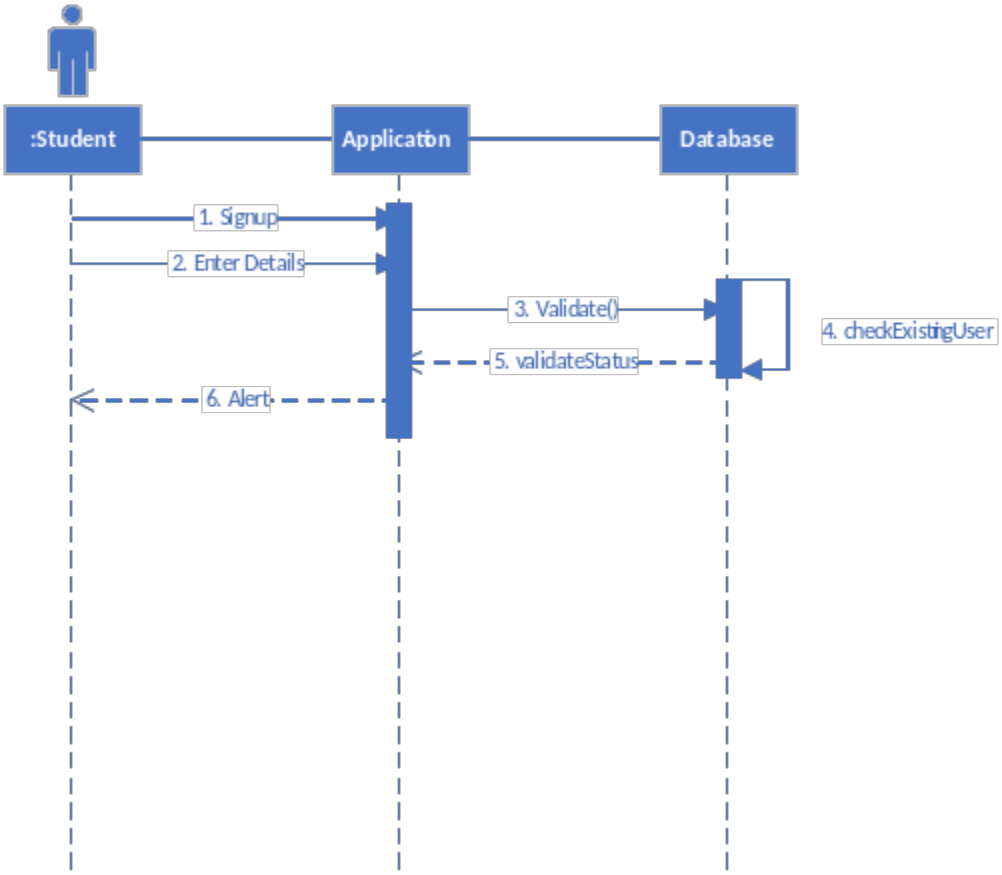


Figure 10 - SD - Registration

3.6.2. SD-2: User Creation

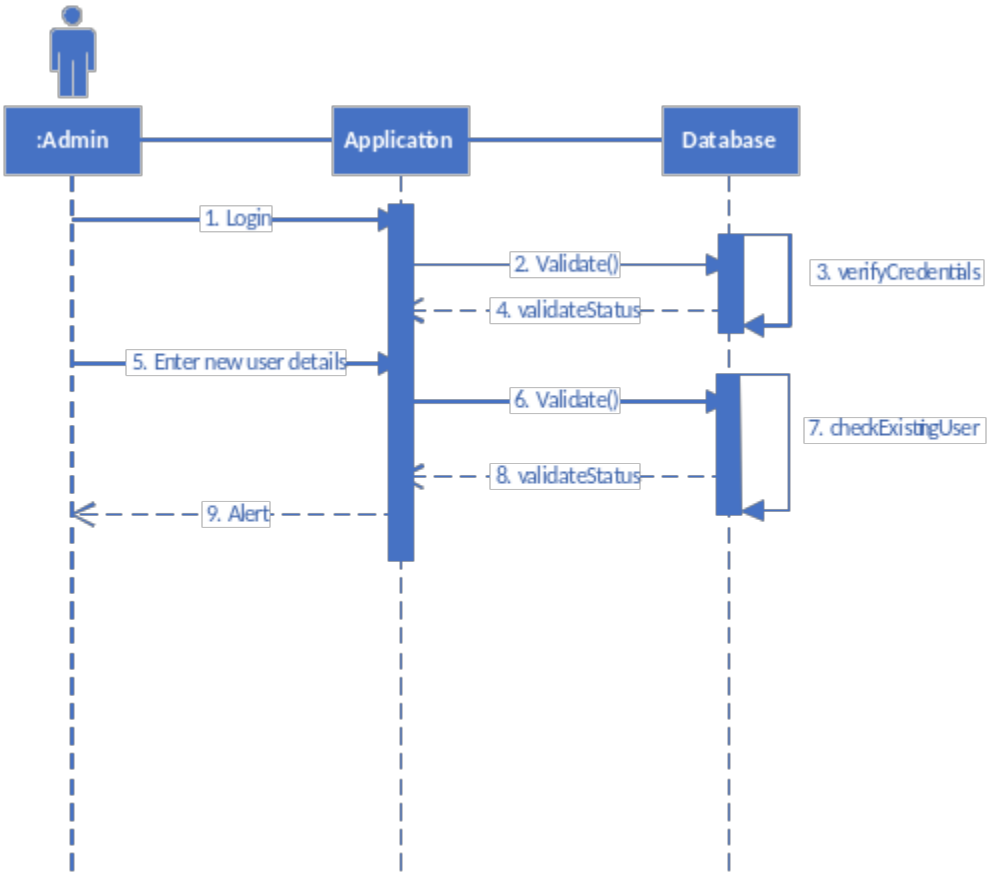


Figure 11 - SD - User Creation

3.6.3. SD-3: Login

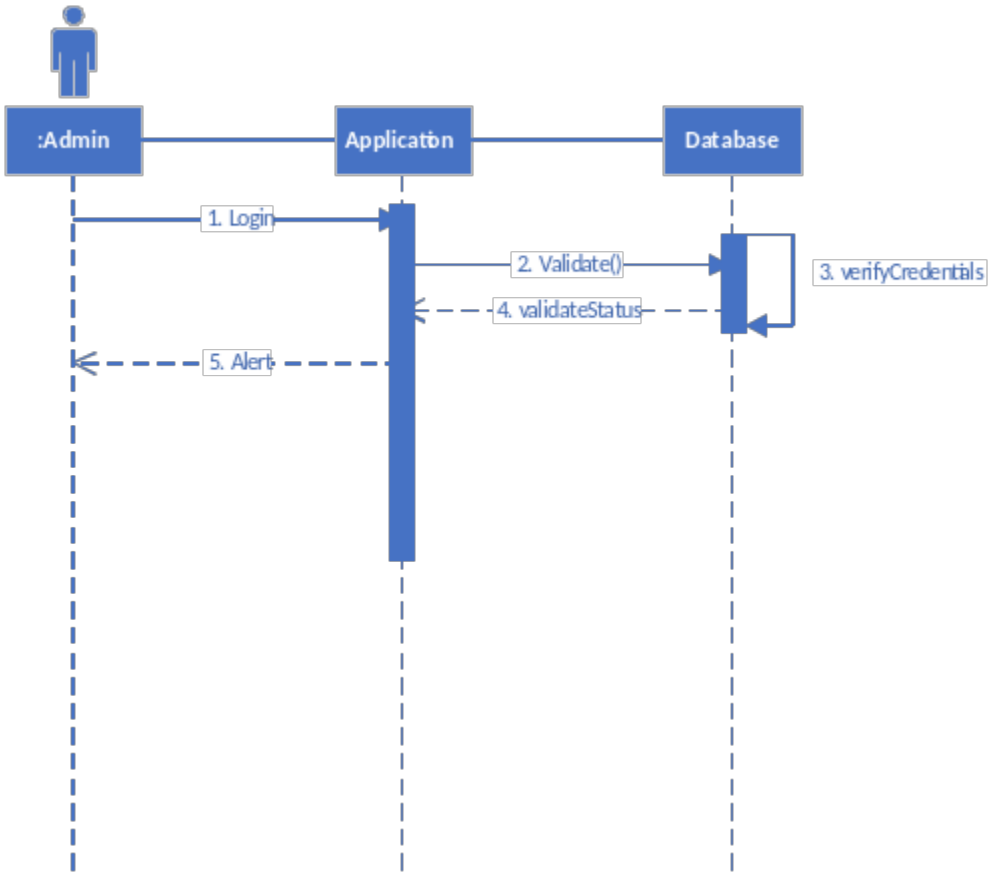


Figure 12 - SD - Login

3.6.4. SD-4: Add Programmes

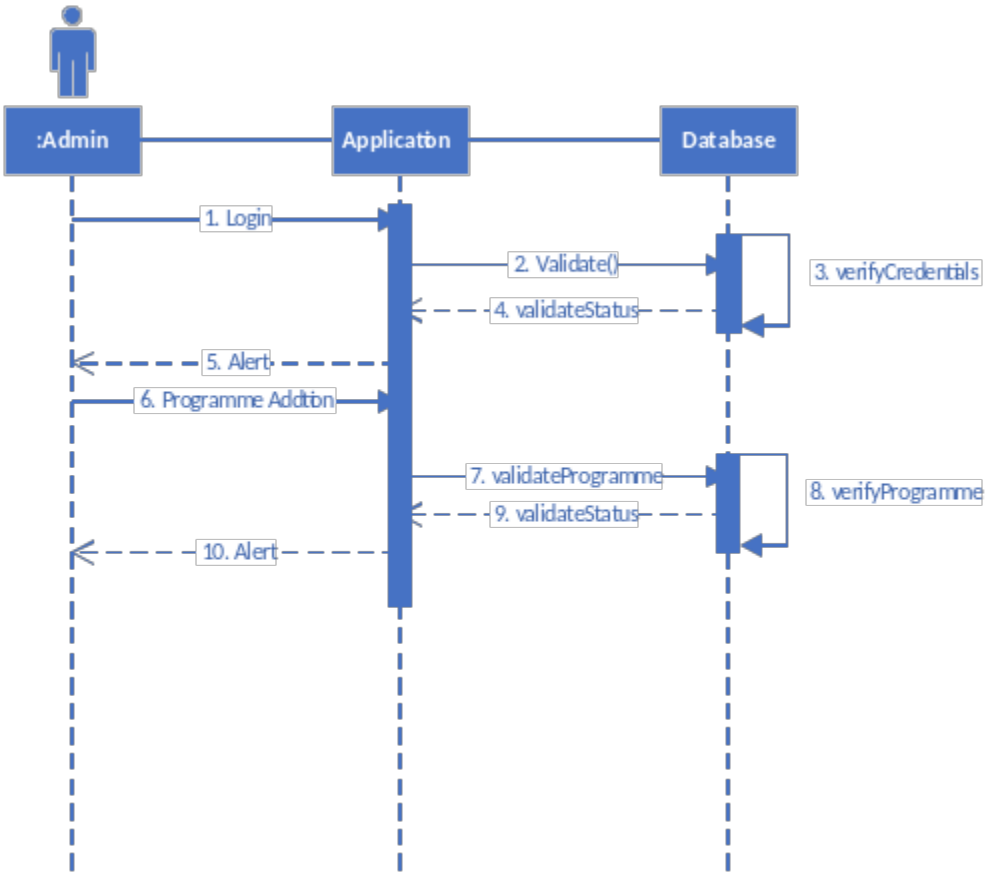


Figure 13 - SD - Add Programme

3.6.5. SD-5: Add Course

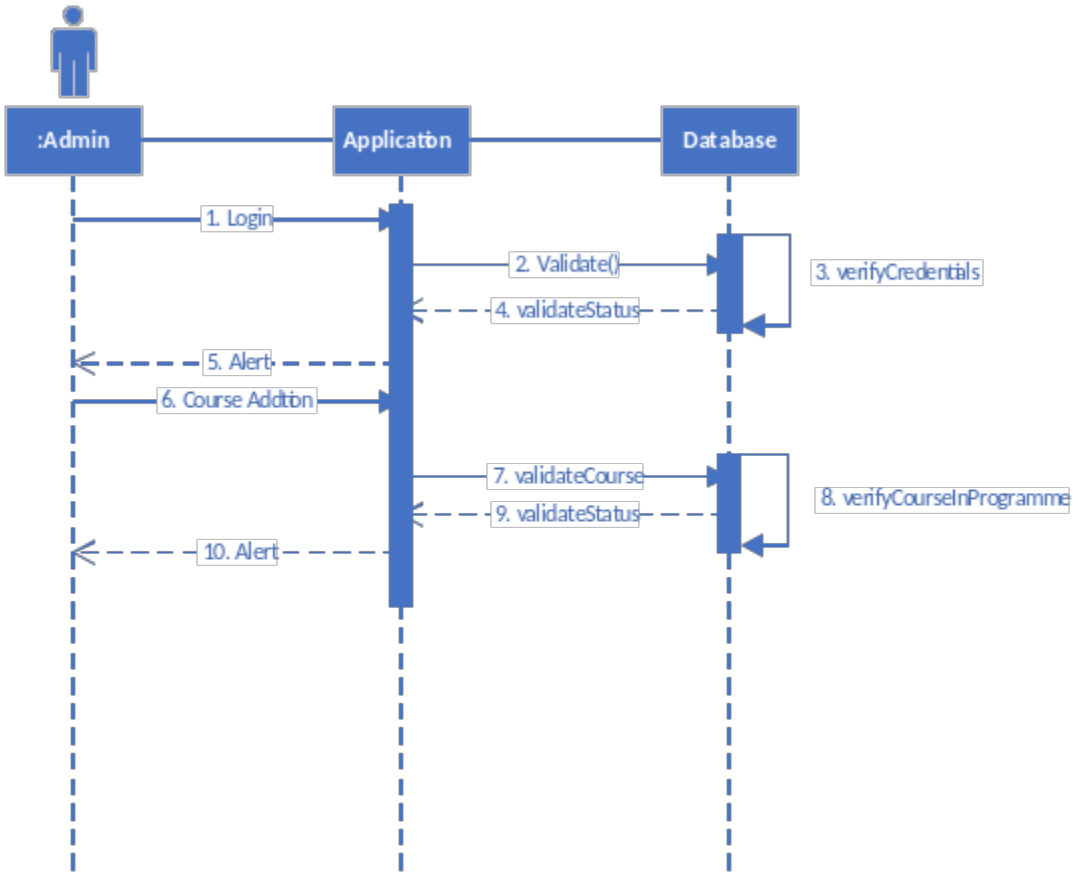


Figure 14 - SD - Add Course

3.6.6. SD-6: Create Activity

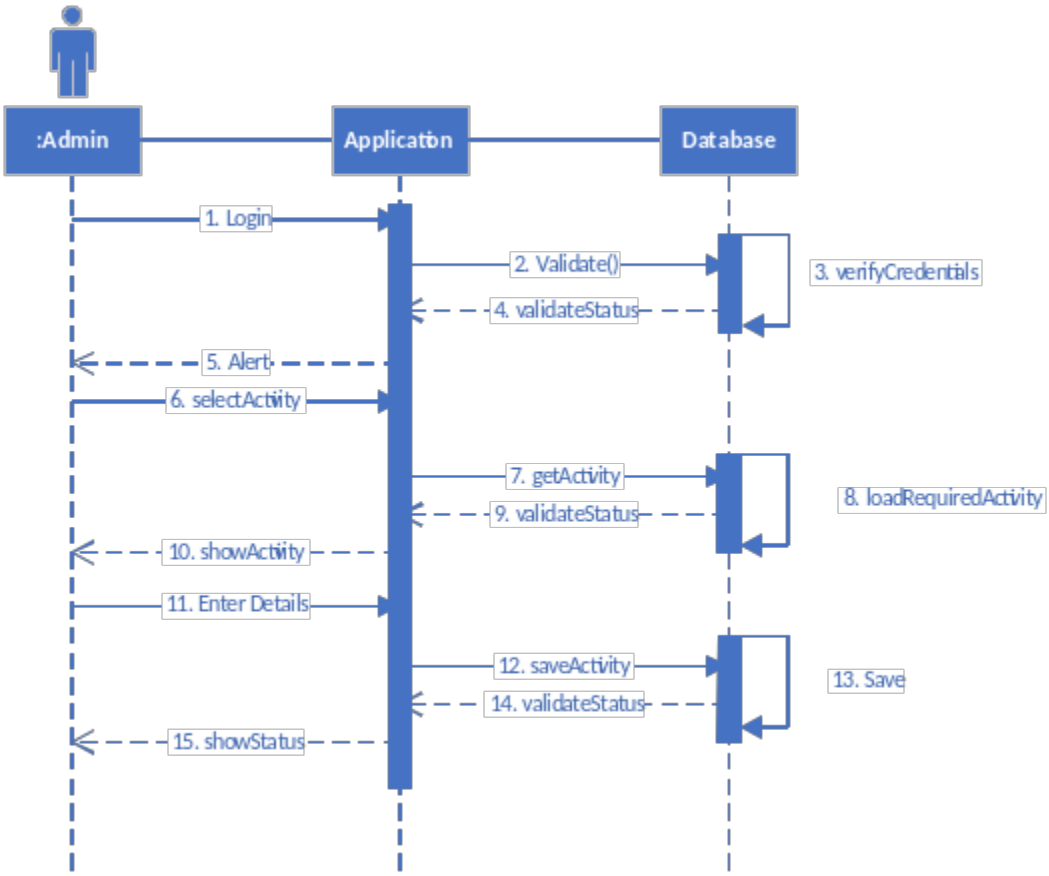


Figure 15 - SD - Create Activity

3.6.7. SD-7: Attempted Activity

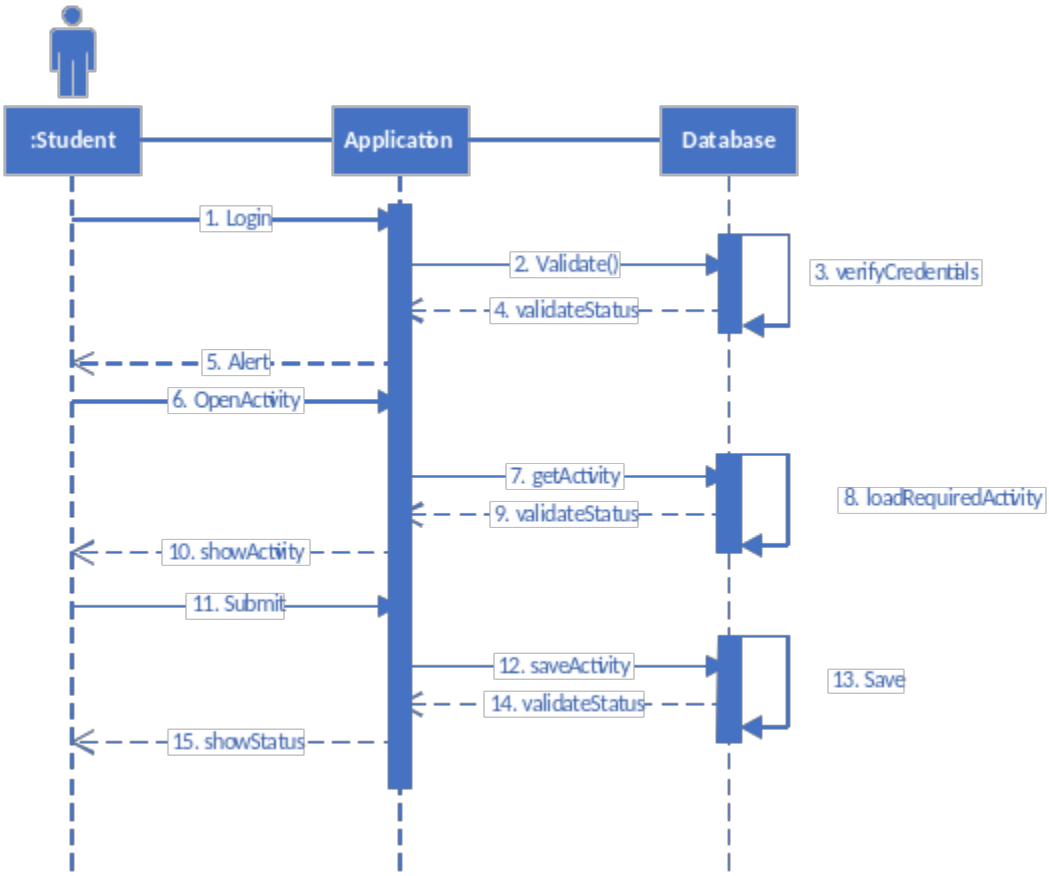


Figure 16 - SD - Attempted Activity

3.6.8. SD-8: Mark Activity Result

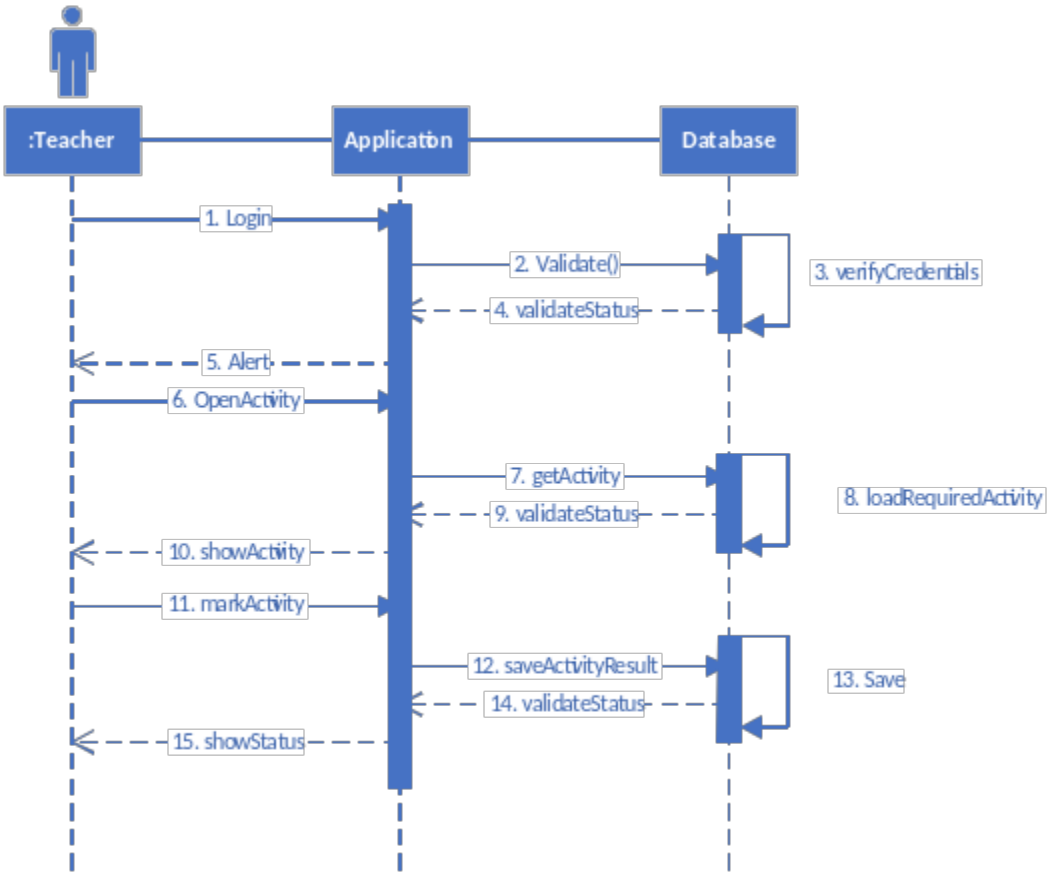


Figure 17 - SD - Mark Activity Result

3.6.9. SD-9: Generate Reports

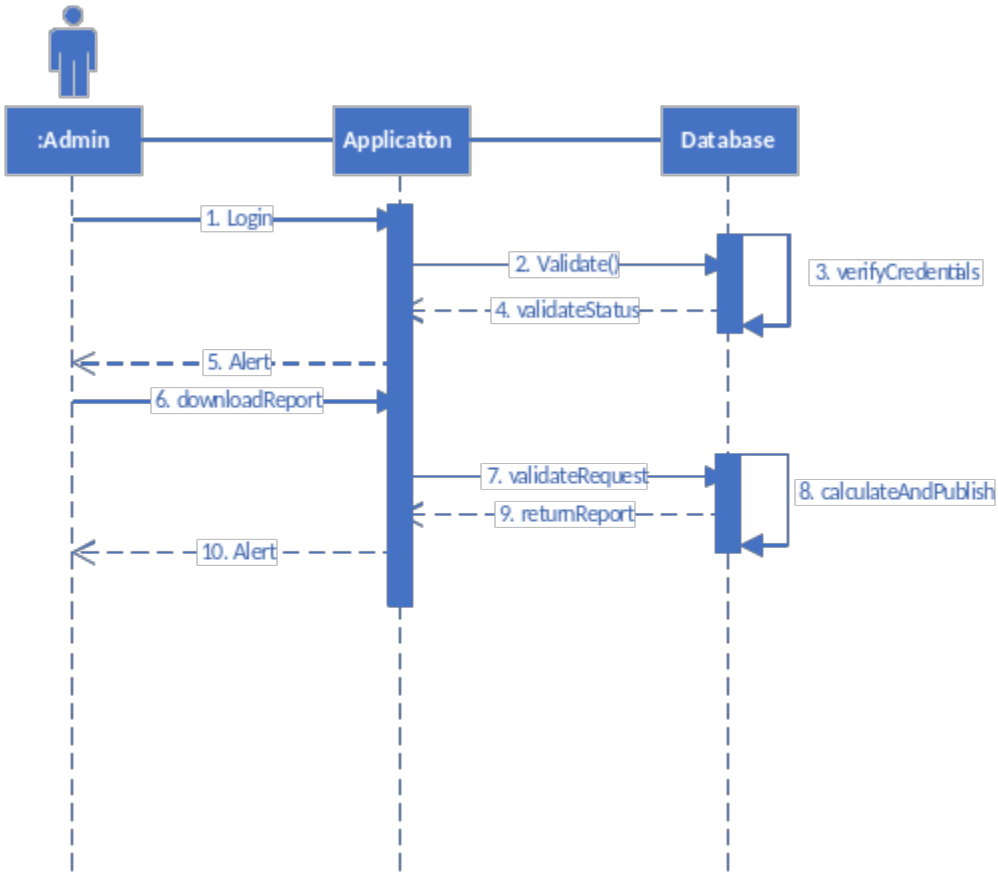


Figure 18 - SD - Generate Report

3.6.10. SD-10: Generate Roll # Slips

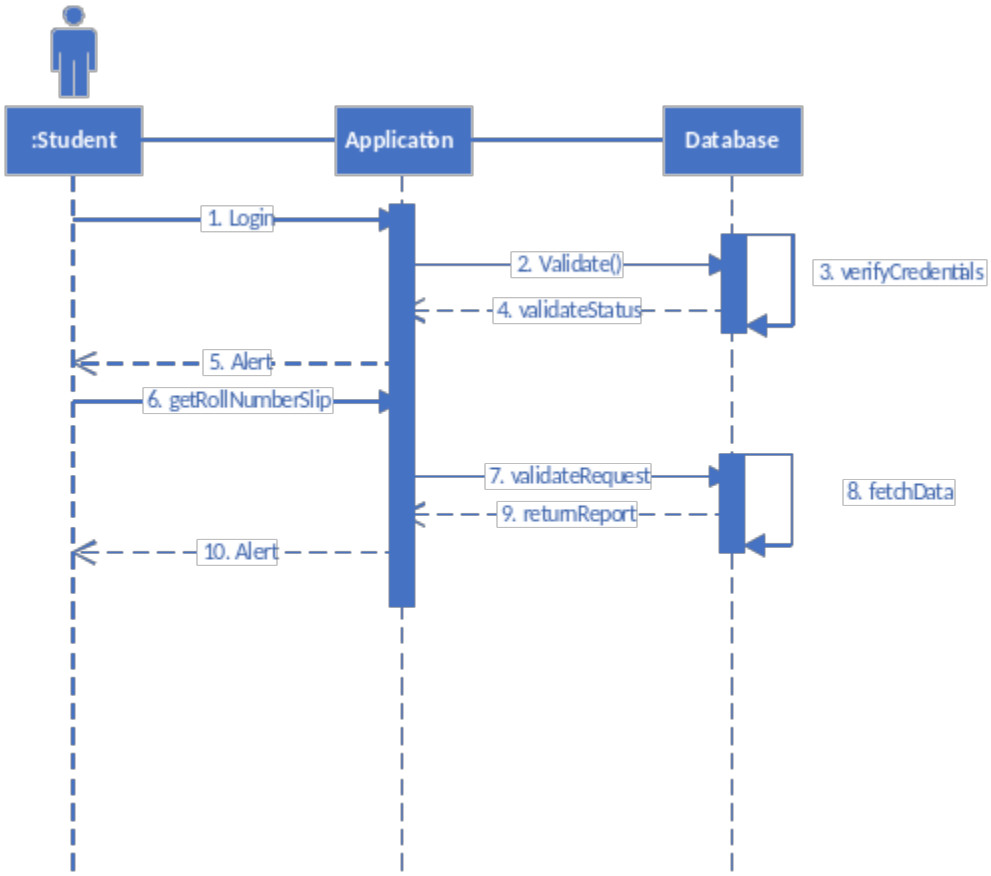


Figure 19 - SD - Generate Roll # Slip

3.7. Object Model/Logical Model: Class Diagram

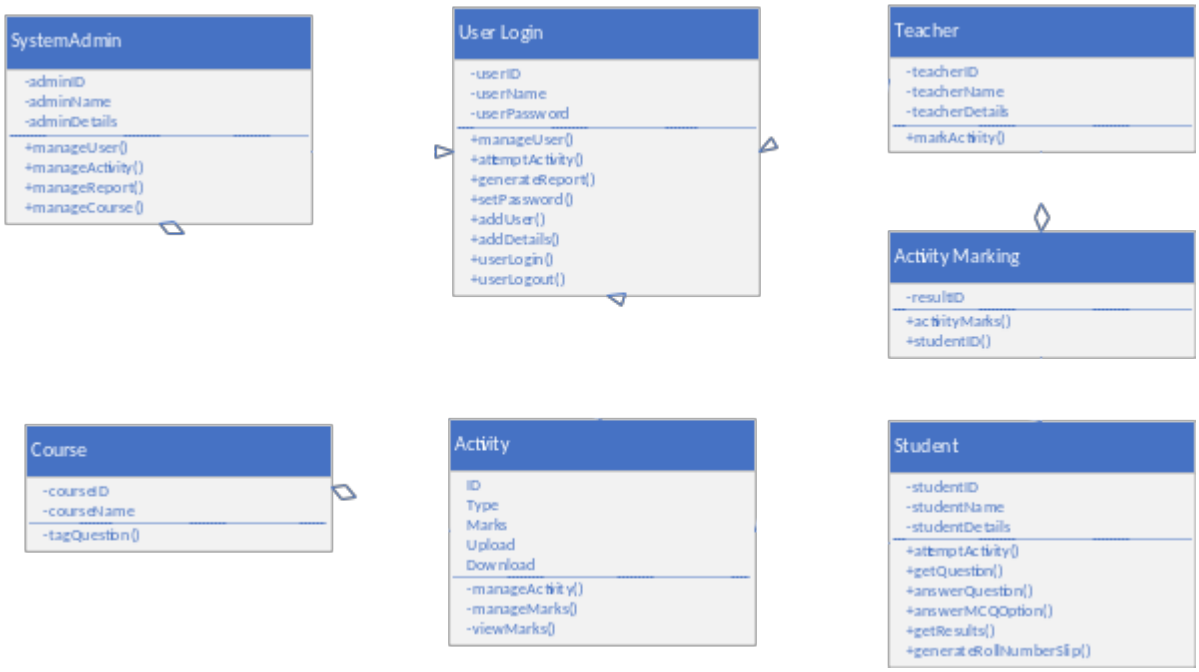


Figure 20 - Class Diagram

3.8. Database Model (Database Diagram)

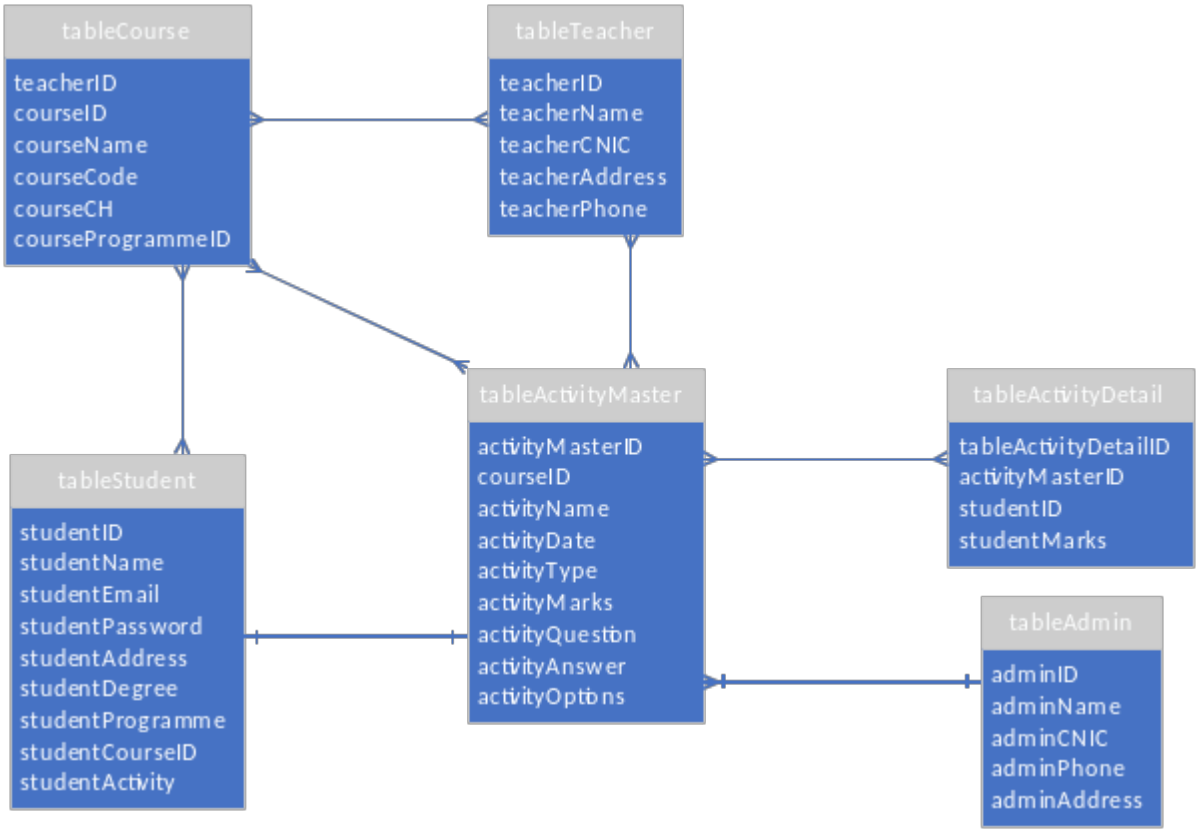


Figure 21 - Database Diagram

3.9. Graphical User Interfaces

The interfaces below are the concept wireframes of the application and there may be chances the representation here may differ from the actual project.

3.9.1. Login Screen

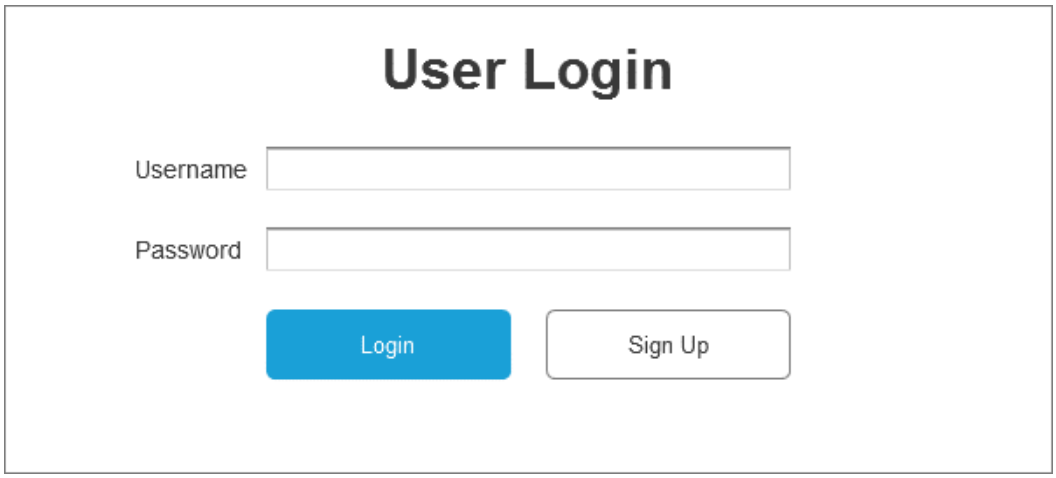


Figure 22 - Login screen

3.9.2. Signup

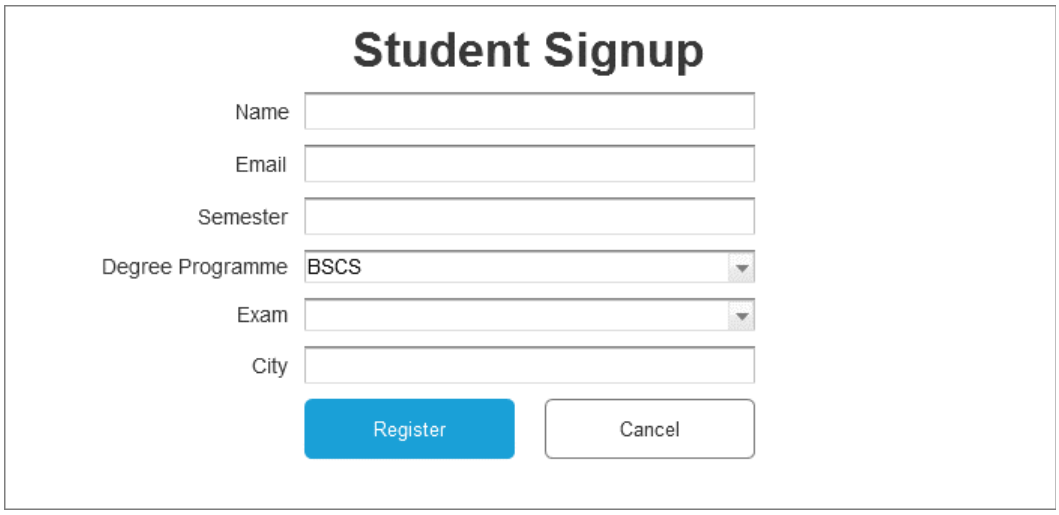


Figure 23 - Signup screen

3.9.3. Reports Generation

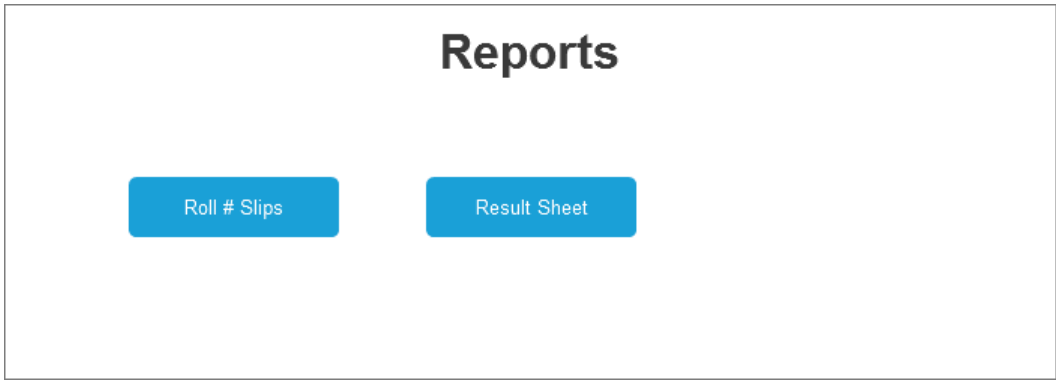


Figure 24 - Reports generation screen

3.9.4. Add Teacher

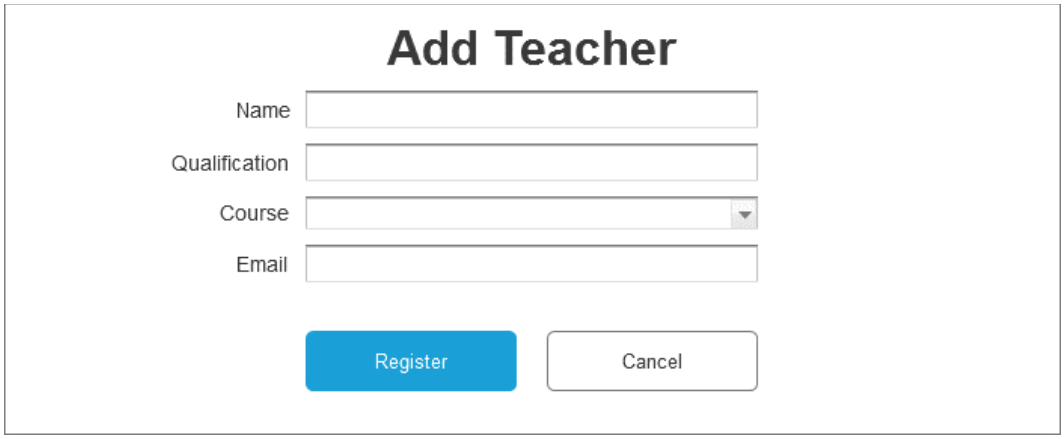


Figure 25 - Add teachers screen

3.9.5. Add Degree

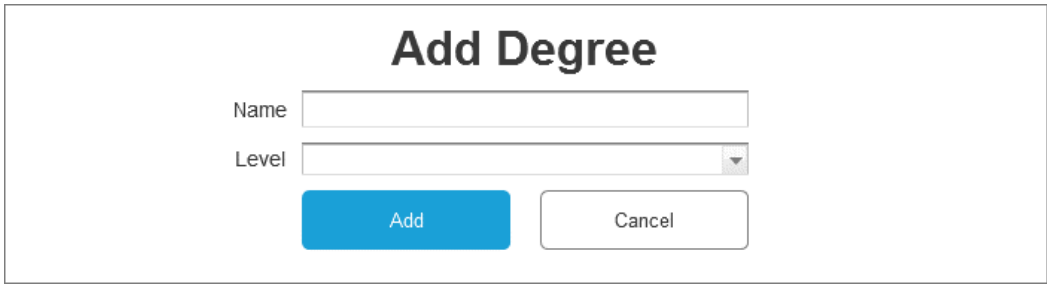


Figure 26 - Add Degree Screen

3.9.6. Add Programme

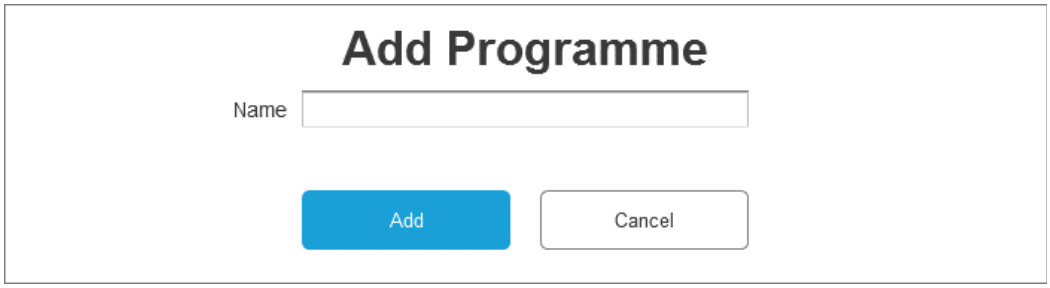


Figure 27 - Add Programme Screen

3.9.7. Add Course

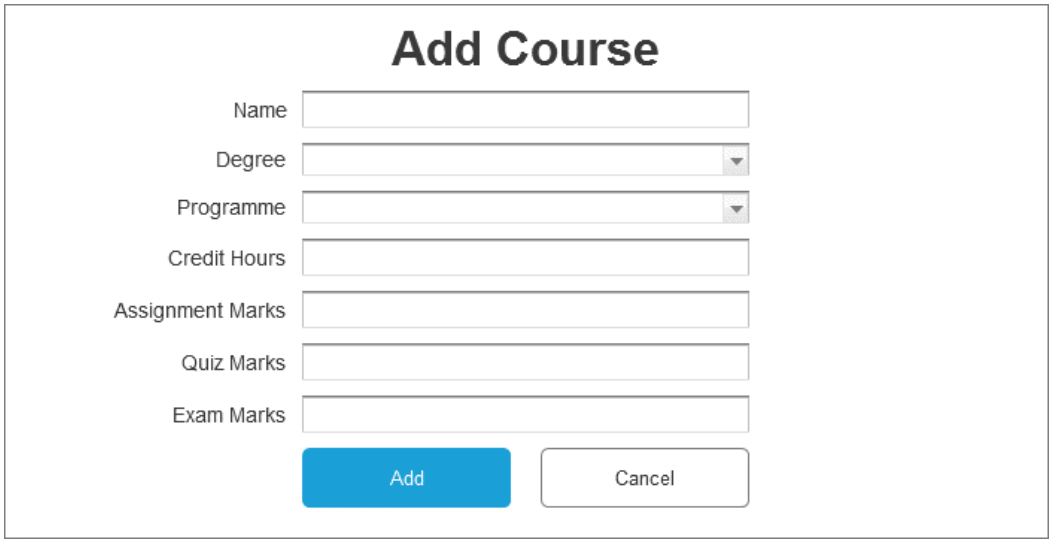


Figure 28 - Add course screen

3.9.8. Activity Marking

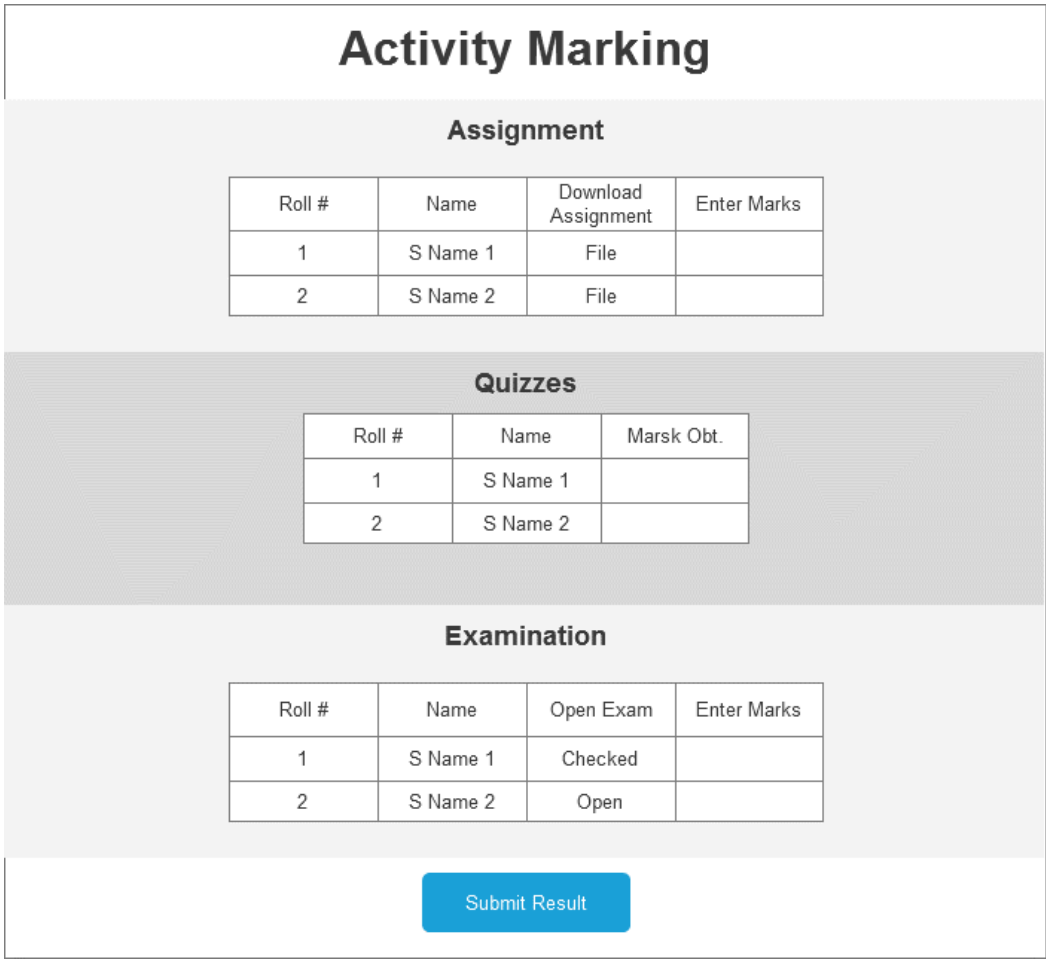


Figure 29 - Activity Marking Screen

3.9.9. Activity Adding

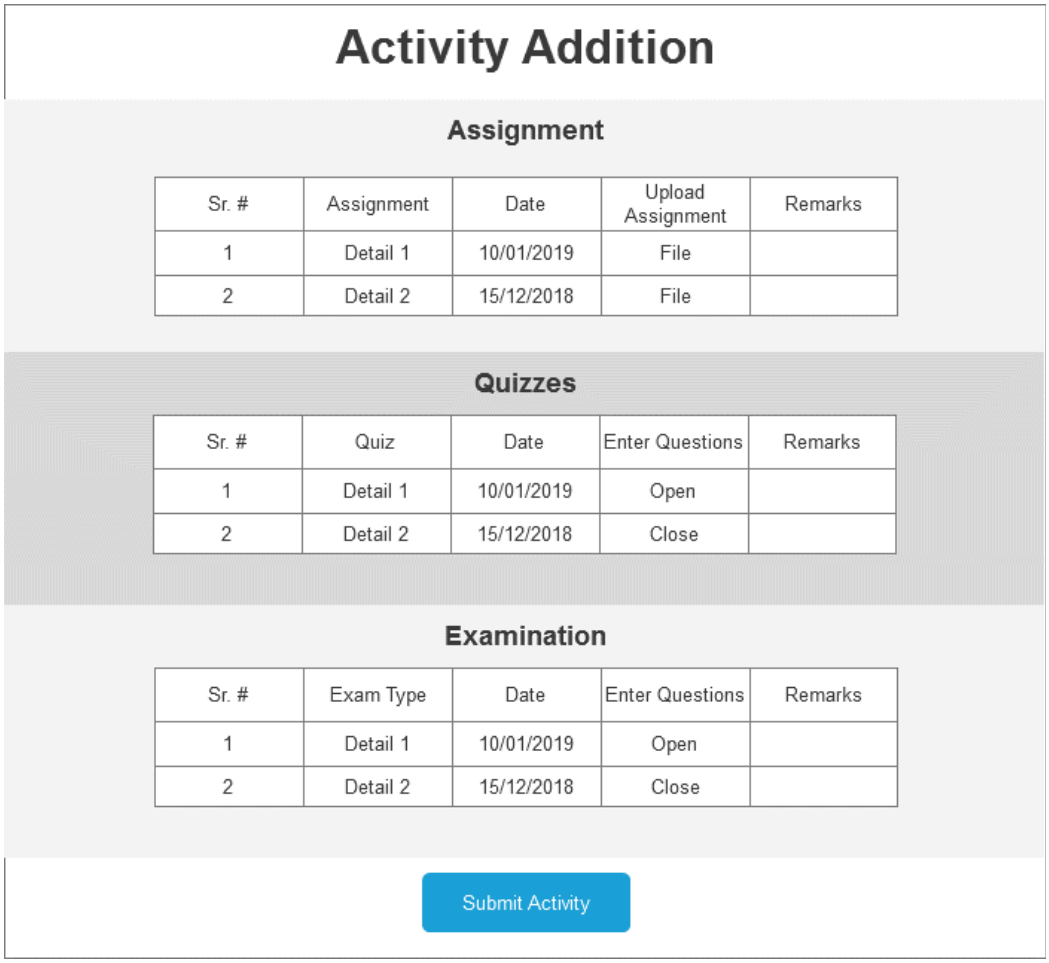


Figure 30 - Activity Addition Screen

3.9.10. Making Activity

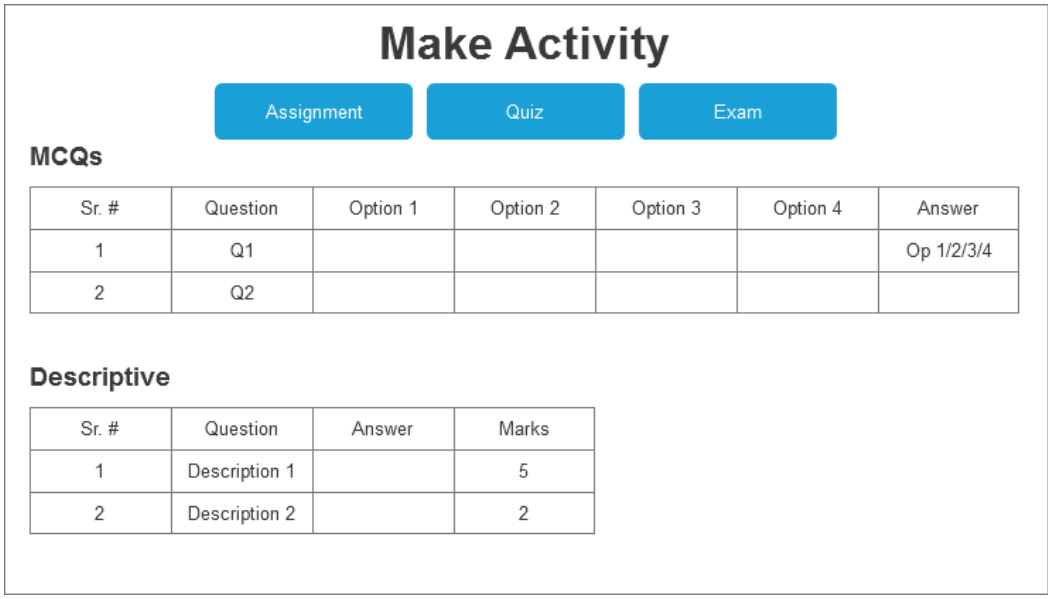


Figure 31 - Activity Making Screen

3.9.11. Student Screen

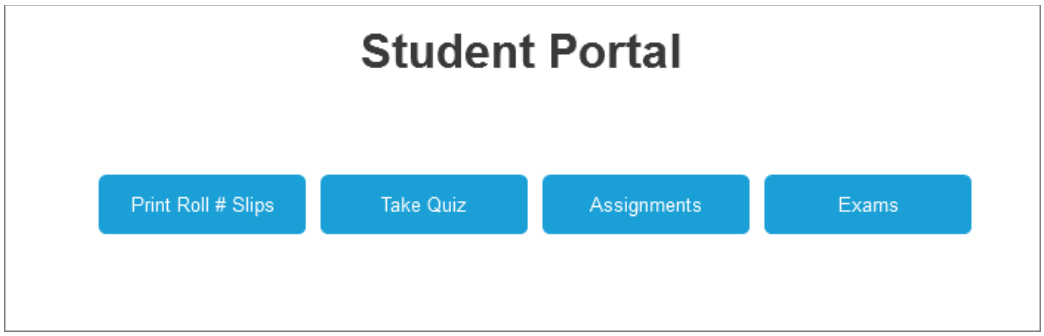
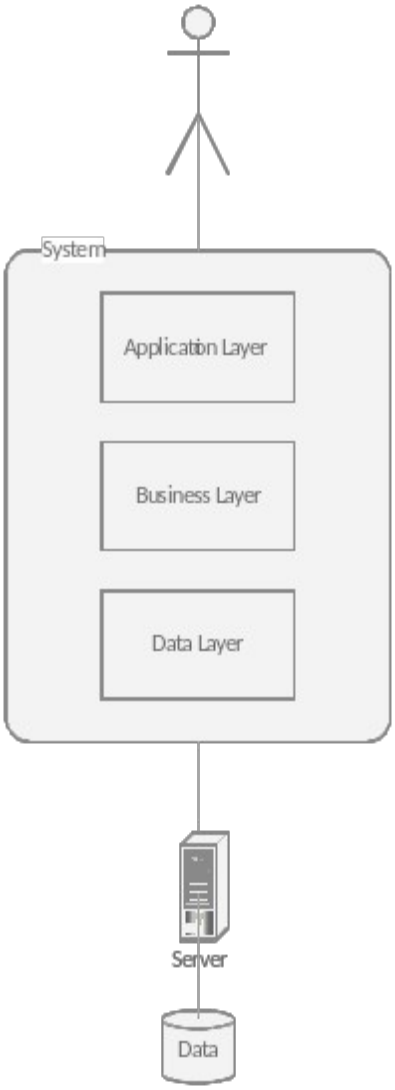


Figure 32 - Student Main Screen

CHAPTER 4
Development

4. Chapter 4: Development

4.1. Development plan (Architecture Diagram)



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