MES
(MAP EXERCISE SIMULATOR)

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Certificate of correction & Approval

This is to officially state that the thesis work contained in this report titled **"MES" (Map Exercise Simulator)***Is carried out by:***Adnan Hamid, Ahsan Iqbal Malik, Immad Ahmed Awan, Murad Ali Kayani***under my supervision and that in my judgment, it is fully ample, in scope and* *excellence, for the degree of Bachelor of Computer Software Engineering from National University of Sciences and Technology (NUST).*

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Dedicated to my remarkable guardians and adored kinfolks whose gigantic help and collaboration drove me to this magnificent achievement

Abstract

Since computers and digital gadgets have become an intrinsic part of our daily lives, why not use them to save our time and effort in a new way. The traditional ways of map exercise is based on a hard copy map on which cluttering of military symbols in done by the military tentacles. Users need a hard-copied map to perform or practice the exercise.

Map Exercise Simulator provides a digital platform where soldier and officers of Pakistan Army can easily plot/plan their exercise in more easy and efficient way. It not only provides speed of action but also provides easy access to each individual who want to access it remotely.

Map Exercise Simulator will not only benefit academically but also it will also give lots of financial benefits by replacing the thousands of military maps which are been saved in hard copy and worn out with passage of time. It will give security and confidentiality to the planned exercises.

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Chapter 1

1.1. Introduction

The Map Exercise Simulator or MES would be used mainly as a training aid and help the Instructors at various schools of instruction of Army to conduct their map exercises in a better and efficient way. It will also affect the other variables such as time, cost and work can be done efficiently through the proper chain of command.

1.1.1. Intended Audience and Reading Suggestions

The Software Design Specification (SDS) document is meant for the following stake holders.

- **Project Supervisor:** To assist in project supervision and guiding the team in a better way.
- **Development Team:** To help in development of product and trace-back of functionalrequirements.
- **Testing Team:** To help the testers to understand the applicable constraints.
- **Users:** Pakistan Army Soldiers/Officers

UG Project Evaluation Team: To help the evaluation board in for gauging the progress of (MES)

1.2. Motivation

Since computers and digital gadgets have become an intrinsic part of our daily lives, why not use them to save our time and effort in a new way. The traditional ways of map exercise is based on a hard copy map on which cluttering of military symbols in done by the military tentacles. Users need a hard-copied map to perform or practice the exercise.

Map Exercise Simulator provides a digital platform where soldier and officers of Pakistan Army can easily plot/plan their exercise in more easy and efficient way. It not only provides speed of action but also provides easy access to each individual who want to access it remotely.

Map Exercise Simulator will not only benefit academically but also it will also give lots of financial benefits by replacing the thousands of military maps which are been saved in hard copy

and worn out with passage of time. It will give security and confidentiality to the planned exercises.

1.3. Project Vision

We propose a system that will provide core functionalities i.e. Digital plotting on Google map. This web application willprovideeasy and efficient plotting of military symbols on Google map.

- Instructor launches app and set narratives for student with essential marking of the map.
- Student do mark as per the asked narrative and submit.
- The submitted marked map can be graded by instructor and can be saved.

This way MES will provide ease and efficiency to this very significant part of military courses and cadres being conducted all over the Army.

1.4. Project Objective

1.4.1. Primary Objectives:

I.   Digital platform for planning exercise.

II.   Minimize the time for plotting symbols,

III. Minimized effortsof saving bundles of hard copied maps.

IV.   Providing more interactive and clearer picture of the considered area.

1.4.2. Academic objectives:

II.   Development of aweb-based application for end users.

III. To automate the map exercises in Army schools of instructions.

IV.   Introducing a shared medium for military student and instructors for evaluation of exercise planning.

1.4.3. Application / End – goal objectives:

I.   To facilitate the end users of the application in terms of digital map plotting platform.

II.   To enable the military instructors to choose any area in the world for setting narratives for military students.

III. To save the precious map planning of military soldiers for future use.

IV. To enable a digital and easier platform for students and instructors in military schools of instructions.

1.4.4. Deliverables

II. Complete working project
III. Web application
IV. Documentation
V. Video of working of Project

Chapter 2

2.1. Literature Review

2.1.1. Introduction

Maps are the visual representation of the area of land or sea. Maps are used in many areas including the military of every country and nation. In military basically, maps are used to plot and mark out the strategies of war and how to proceed forward. All possible scenarios are kept in mind and then they are plotted on maps. Different symbols have different meaning and different representation.

It is time consuming and takes a lot of effort. As maps are large and they take huge amount of space with a map exercise simulator, it will become easy to plot and perform the exercise. These days everyone is using some form of technology. If a force is deployed in some area and you have to explain the strategy of how to capture or free an area you can easily communicate with them through the simulator explaining to them how to and where to move forward. Map exercise simulator will make things a lot faster and easier.

2.1.2. Problem Domain

Keeping in view the current map exercise modalities and their significant role in training of Army personnel.Following problems were observed which leads to the idea of this project:

- Training Exercises being done on Maps in Hardcopy.
- Too much cluttering on Map.
- Security Issues.
- Less interactive.
- No storage of Ideas.
- Large number of Maps required.
- Less Legible.

2.2. Related Work

Currently there are 1 or 2 systems that have worked on something similar to this. They have made a web application the provides the basic functionalities to visualize the mission on maps. We are developing Desktop application which will provide the functionality and features of military exercises using a simulator.

2.2.1. Shortcomings/issues

- Internet access is necessary
- Computers or laptops should be present as the application is a desktop application.
- Location accuracy depends upon the quality of the user's mobile set.
- The server will not be available in case of maintenance and testing issues. No backup server configuration is provided.

2.2.2. Proposed Project

The purpose and objective of this project is to allow the military leader to plan and workon maps more easily at tactical level. The Scope is currently limited to tactical planning and at maximum Brigade level but can be enhanced to operational and strategic levels in the subsequent versions. Out project will help and enable the soldiers and officers of the Military to plan and simulate the exercises and their tactical plans. The Simulator is designed to replace the paper maps and make it easier for officers and soldiers to work with maps more easily. The project will not only serve as a training aid but can also serve an effective tool to simulate and plan real time operations.

2.3. Deliverables

2.3.1. Software Requirement Specification (SRS)

The purpose of the document is towards the introduction of a comprehensive picture of the MES. It describes the persistence and characteristics of the system, the interfaces, the boundaries of the system, whatever the product will do, its processes and workings, noted that the constraints by which it ought to operate and how the system is going to act in response to exterior stimuli. This paper is intended for developers and the participants of the system. It shall describe how the system will primarily aid concerned groups to team up and cooperate with each other.

2.3.2. Software Architecture Document

In this document the overall architecture of the system is discoursed, also including the introduction of various components and subsystems. It is chiefly braced by system Architecture diagram which depicts an insider's viewpoint of the system by unfolding the high-level software components that execute the major functions to make the system operational.

2.3.3. Design document

The Software Design Document is a record to give documentation that shall be utilized to help in programming advancement by giving the subtleties to how the product ought to be fabricated. Inside the Software Design Document are narratives and graphical documentation of the product plan for the task. It covers every single practical prerequisite and shows how they communicate with one another adroitly. The low-level design additionally appears with respect to how really we have been executing how we are going to actualize these requirements.

2.3.4. Implementation code Document

The implementation code document provides details about the pseudo code for the application and project prototype.

2.3.5. Software Testing Document

This document has testing modules in which there are certain test cases which depicts the correctness and accuracy of the project.

2.3.6. Final Project Report

This is the thesis report which compiles all the previous and current working for the project. Thesis report provides the whole summary for the project and also give details about each and every aspect of the project starting from introduction of the project, literature review, requirements leading to design discussions then testing and lastly future work and conclusion.

2.3.7. UserManual

User Manual gives details about the use of the product. It contains details as how to use the product. Its functionalities and details of every aspect as how that works and how to use it. User Manual is for users to get to know the product.

2.4. Technological Requirements

EMTS entails subsequent software and hardware requirements specifications.

2.4.1. Software Interfaces

Following software will be used in this project

- Visual studio
- SQL
- Adobe Photoshop
- Adobe XD
- Adobe Illustrator
- Adobe after effects

2.4.2. Hardware Interfaces

The Simulator would be operated on a PC or a laptop as convenient by the user but it should not be connected to the internet. Computer system hardware interfaces are as follows

- System shall have keyboard/mouse input
- System shall have a monitor

2.5. Operating Environment

The system of MES shall run on the computer system with following specifications

- Pentium 4 or higher CPU
- At least 512 MB RAM
- At least 1 GB free disk space
- Windows 7 or higher

2.5.1. Programming Interface

Programming interfaces for project are:

- Visual Studio
- C sharp

Chapter 3

3.1. Overall Description

3.1.1. Product Perspective

MES can be useful in following perspective:

- For training in various school of instructions and in units to train the young leaders of the Army.
- Working with maps can be a lot difficult and sometimes very time and effort consuming; the same amount of effort can be put into the planning rather than preparing the maps etc.
- It would be helpful in increasing the productivity of the young leaders.
- Easy user interface and a very guiding user experience to benefit the users.
- The option to add updated symbols military symbols and military abbreviations can help the users to keep the software up to date by themselves without a need of constant software updates to add new symbols if something is added or corrected by the military.
- Apart of training exercises an option would also be there to plot on real world maps and plan real world operations the capabilities of which can be enhanced in the subsequent versions but the real focus of this project is to aim on improving the map exercises at various schools of instructions run by military.

3.2. Product Functions

Following are the key functions of the Map Exercise Simulator (MES).

3.2.1. User Profiles

MES registers every user and maintain their records.

3.2.2. Map Access

This application provides google map access to the instructor who can choose any place in the world and set narrative for the military students.

3.2.3. Narrative Set

The military instructor would be able to set the narratives for students.

3.2.4. Google Map Integration

The system will allow military instructors to access any place on google map and create exercise for the students.

3.2.5. Login/Access Right

MES will allow users to login, based on their roles. User of the application can either sign-in as student or instructor. The admin will give these rights.

3.2.6. Course Enrollment

Different course enrollment can be done and be allotted to instructors/students by admin.

3.2.7. Authentication

MES will provide authentication to all users protected by unique passwords.

3.3. User Classes and Characteristics

- The end users of this system would be military personnel only.
- Officers and soldiers of all arms should be able to use it.

3.4. Operating Environment

OE-1: MES will be managed with Firebase database management system.

OE-2: MES will run on any desktop computer or laptop with a working internet connection.

OE-3: The hardware, software and technology used should have following specifications:

- Operating System: PC
- Capability to link to Wi-Fi or mobile communication network.
- Capability to exchange information across the network.
- Processor that possess the speed of 1 GHz
- Ability to use Location services Google maps and other services of mobile.
- Ability to take over input from user
- Device needs to have at least 512 MB of RAM

3.5. Technology Platform:

3.5.1. Web-Based Front End:

MES's front-end would be developed for Web-based computers, providing the users with the interface to get registered on the server, and load maps.

3.5.2. Programming languages:

- C Sharp

3.5.3. Programming Environment

- Visual Studio
- .Net

3.5.4. Database

- MySQL Database

3.6. Design and Implementation Constraints

The intent of this project is to make a simulator for map exercises so that planning can be done more efficiently. The Security of the said software would be the responsibility of the formations and the units in which it would be deployed. The systems on which this software would run should not be connected to the internet. The distribution of this software should not be done on insecure USB devices that had been connected to pcs connected to internet.

The design includes:

- A basic Login page
- Some Event Handlers
- An option for importing maps and pan tilt zoom option for the maps.
- A Text field to enter narratives which will then be shown to the students
- A Color/fill and stroke weight tool, a draw tool and shapes and line tool.

3.7. User Documentation

UD- version 1.0: Ultimate publication shall be complemented with a user manual to enlightenusers how to use MES. User documentation that would be delivered along with the final product

3.8. Assumptions and Dependencies

- The Basic assumption is that majority of the soldier base is not very tech savvy so the complexity to be kept very simple

- The maps in the system should be as accurate and treated as correct and in case of any discrepancy a support request for correction can be initiated

- Because of the Security consideration this application is not to be connected to the internet.

- The final release to be free of any bugs and errors because of the distribution that needs to be restricted to military personnel only.

- The Software should not be copied in an insecure USB and transferred to other devices connected to internet.

- To be used only on classified official Systems.

Chapter 4

4.1. Software Requirements Specification

4.1.1. System Features
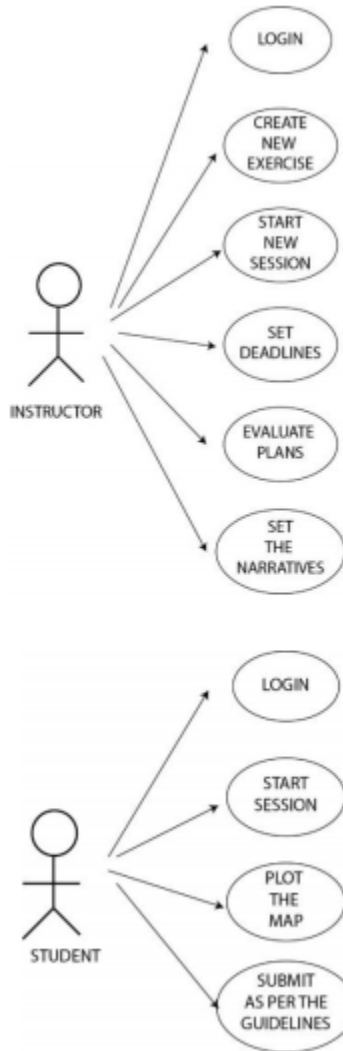
Figure 1: Use Case Diagram

4.2. Other Non-functional Requirements

4.2.1. Performance Requirements

- User must have PC available
- Windows 7 and above

4.2.2. Safety and Security Requirements

- This is a classified software so the security of the software would be the responsibility of the end user formations and units.
- It should be made sure that the PCs this software is to be installed in must not be connected to the internet • Firewalls to be installed to enhance security of this sensitive software
- Unauthorized copying and distribution of this software should not be allowed.
- The software should not be copied on an insecure external device
- Every install should be registered and each time the software is copied to a secure external device

4.3. Software Quality Attributes

- MES should be easy to use and understand

- MES should have no downtimes and user maps should be imported without any problems.

- It should be secure and must not be compromised

- It should be reliable with no downtime while a session is in progress

- User defined symbols and abbreviations should be stored and must not be lost at every new login.

4.4. Runtime System Qualities
4.4.1. Functionality
4.4.2. Availability
4.4.3. Usability
4.4.4. Non-Runtime System Qualities
4.4.5. Modifiability
4.4.6. Portability
4.4.7. Testability

Chapter 5

5.1. System Design Specifications

The Map Exercise Simulator, or MES Architecture is compose of UI Layer of the Desktop Application which will be used by the user on the Windows environment there will be an API connected which will serve the Data to and from Central Database on MySQL. The overall architecture of the system is presented in this section, as well as the introduction of different components and subsystems. It is primarily supported by a system Architecture diagram, which represents an insider's view of the system by identifying the high-level software components that perform the system's primary functions.

5.1.1. System Architectural Design

A system's architecture explains the main components, their interactions (structures), and how they communicate with one another. Business plan, quality characteristics, human dynamics, construction, and the IT environment are all contributory considerations in software architecture and design.Software Architecture and Design can be separated into two phases: Software Architecture and Software Design. Nonfunctional choices are cast and divided by functional criteria in architecture. The functional criteria are met in Design.
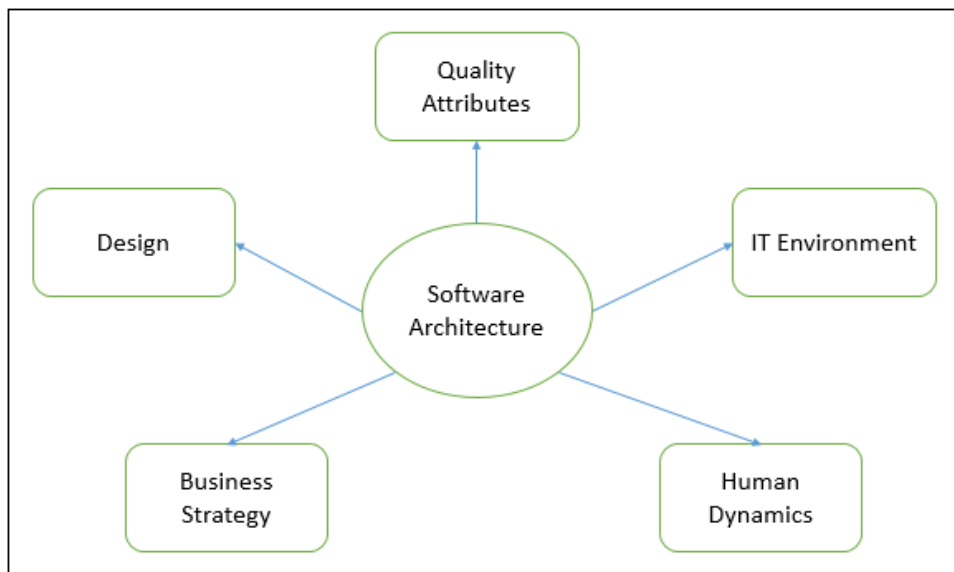
Figure 2 System Architecture

5.1.2. Class Diagram

This section ponders upon the interrelationships and dependencies among various components. It is mainly described by a diagram which is further augmented by explanatory text. UML Class diagram also helps us understanding the system structure.
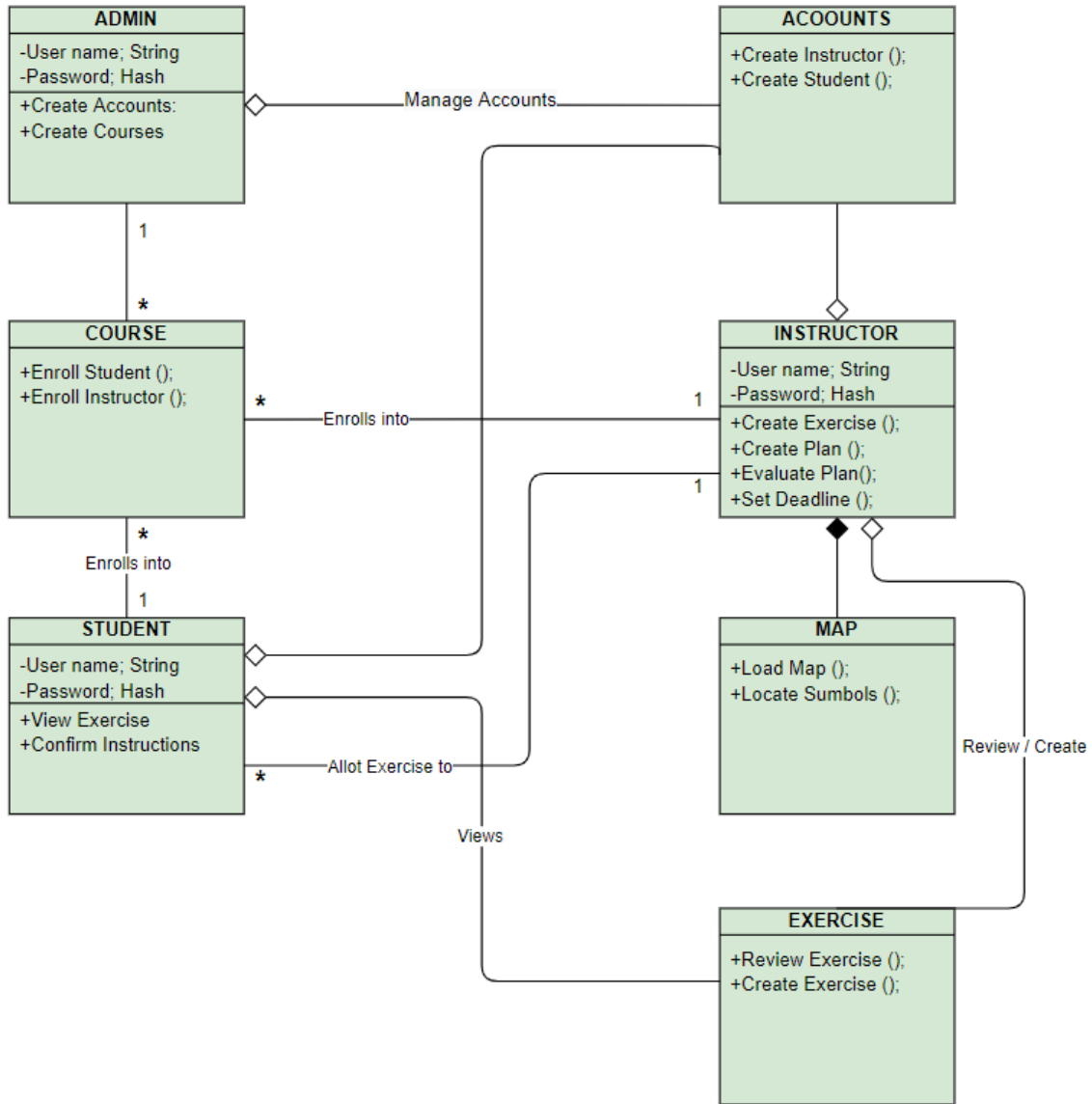
Figure 3: Class Diagram

5.1.3. Use Case Diagram

Use cases describe the Actors of the system and their actions. It gives the overview about how the factors outside the system interact and what actions they perform on the system. The various user classes identified the following use cases and primary actors for the system.
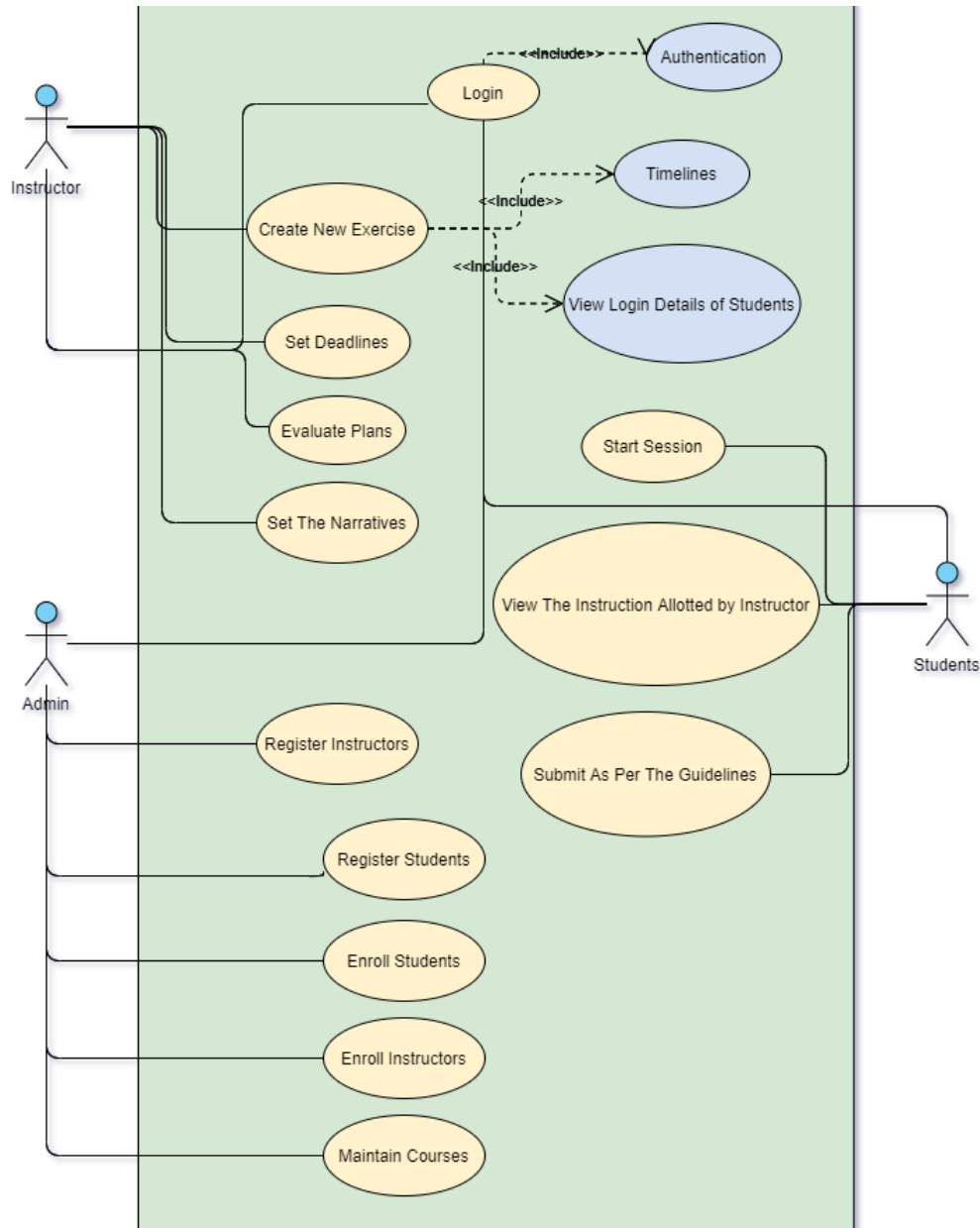
Figure 4: Use Case Diagram
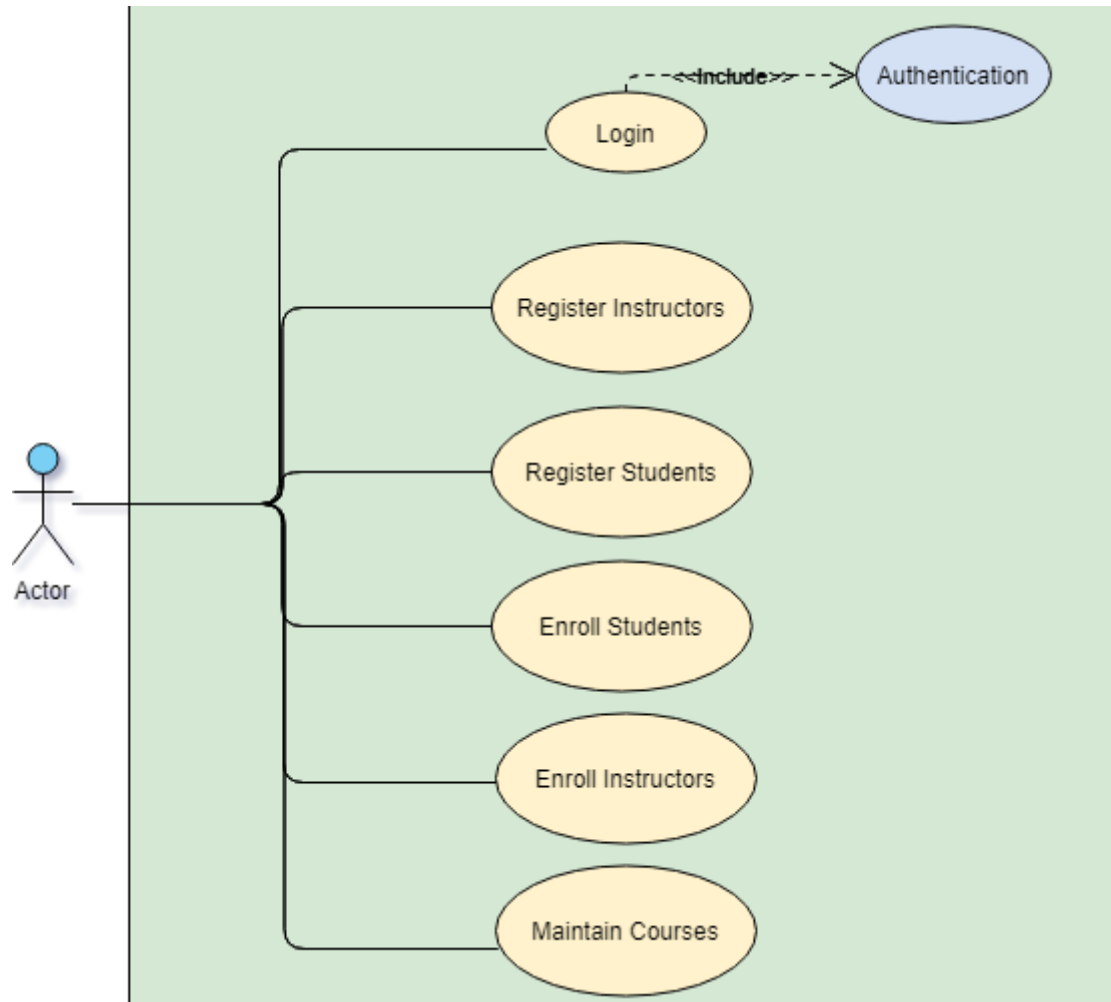
Figure 5: Use Case Diagram – Admin

Table 1: Use Case Admin Table

Actors	Use cases
Admin	1. login 2. Register Instructor 3. Register Student 4. Enroll Student 5. Enroll Instructor 6. Maintain Courses

Table 2Login:

Use Case ID:	1		
Use Case Name:	Login		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin logins to the system by entering credentials		
Preconditions:	The admin has to open the system and put the right information.		
Post conditions:	If the Admin case was successful, the Admin is now logged into the system and directed to the dashboard. If the credentials is not correct the system gives the error and remain unchanged.		
Normal Flow (primary scenario):	This use case starts when Admin wishes to log into the System. The system requests that the Admin enter his/her name and password. The system verifies the entered name and password from the database and logs the Admin into the system.		
Alternative Flows:	If the actor enters an invalid name and/or password, the system displays an error message. The Admin remains on the login page.		

Table 3Register Instructor:

Use Case ID:	2		
Use Case Name:	Register Instructor		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin register the instructor with the credentials which is necessary.		

Preconditions:	The admin need to log in to the system to register the instructor.
Post conditions:	If the Admin is completed the necessary fields the account will be registered and it will redirect it to main page.
Normal Flow (primary scenario):	This use case starts when Admin log in to the system and direct to the dashboard. The Admin will goes in to registered instructor section to register the instructor account. It can be more than two or many as want.

Table 4<u>Register Student:</u>

Use Case ID:	3		
Use Case Name:	Register Student		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin register the Student with the credentials which is necessary.		
Preconditions:	The admin need to log in to the system to register the Student.		
Post conditions:	If the Admin is completed the necessary fields the account will be registered and it will redirect it to main page.		
Normal Flow (primary scenario):	This use case starts when Admin log in to the system and direct to the dashboard. The Admin will goes in to registered Student section to register the Student account. It can be more than two or many as want.		

Table 5<u>Enroll Student:</u>

Use Case ID:	4

Use Case Name:	Enroll Student		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin enroll the Student in the course.		
Preconditions:	The student should be registered the in the system.		
Post conditions:	The student will be enrolled in the specific course which is chosen by the admin.		
Normal Flow (primary scenario):	After registering the student admin will enrolled the student to the courses Which are already in the database.		

Table 6Instructor Enroll:

Use Case ID:	5		
Use Case Name:	Enroll Instructor		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin enroll the Instructor in the course.		
Preconditions:	The Instructor should be registering the in the system.		
Post conditions:	The Instructor will be enrolled in the specific course which is chosen by the admin.		
Normal Flow (primary scenario):	After registering the Instructor admin will enrolled the Instructor to the courses Which are already in the database.		

Table 7<u>Maintain Courses:</u>

Use Case ID:	6		
Use Case Name:	Maintain Courses		
Actors:	Admin		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Admin will register the courses and maintain it.		
Preconditions:	The admin has to register the courses first in the course section.		
Post conditions:	The admin can maintain courses after registering it.		
Normal Flow (primary scenario):	For this use case the admin has to log in to the system and direct to the dashboard after going in to the course section. The admin can register the course and maintain it once the course is registered it stores into the database. And then the student and instructor can be enrolled.		
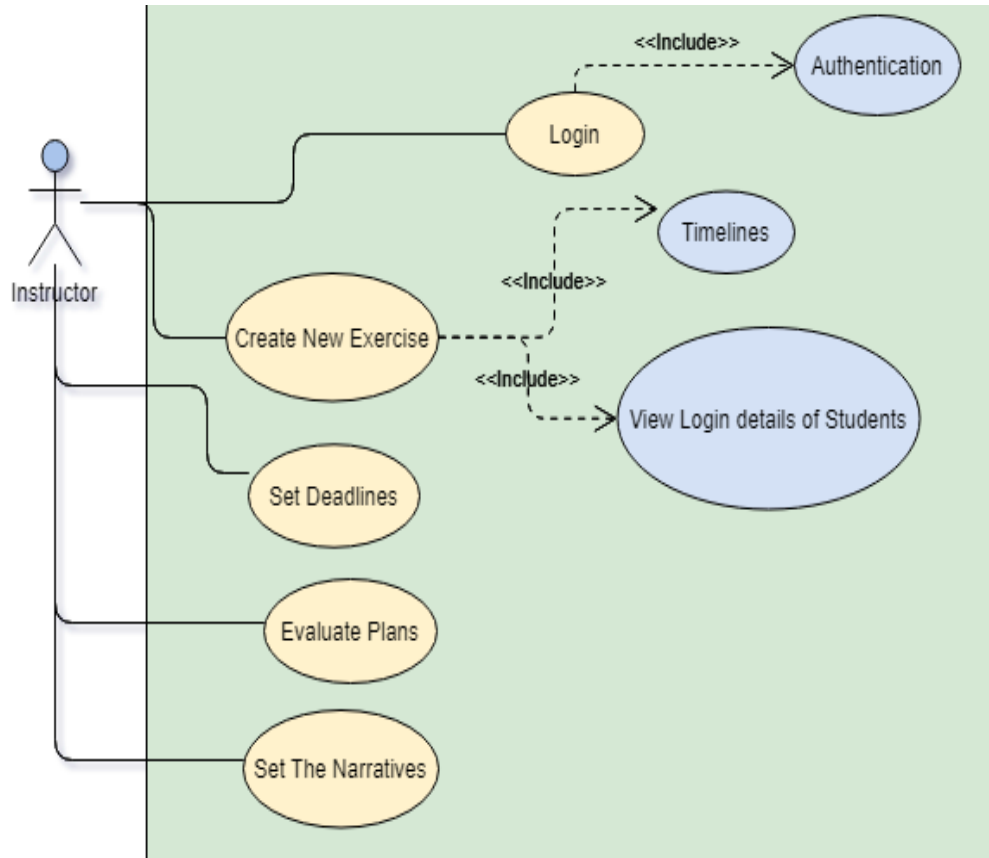
Figure 6: Use Case Diagram- Instructor

Table 8: Use Case Instructor Overview

Actors	Use cases
Instructor	1. Login 2. Create New Exercise 3. Set Deadline 4. Evaluate Plans 5. Set the Narratives

Table 9Login:

Use Case ID:	1
Use Case Name:	Login
Actors:	Instructor

Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Instructor logins to the system by entering credentials		
Preconditions:	The Instructor should be registered.		
Post conditions:	When the right credentials in put in the field of log in page the instructor directed to the Dashboard.		
Normal Flow (primary scenario):	This use case starts when the Instructor log in to the system. Through the login page.		
Alternative Flows:	If the instructor enters an invalid name and/or password, the system displays an error message. The Instructor remains on the login page.		

Table 10Create New Exercise:

Use Case ID:	2		
Use Case Name:	Create New Exercise		
Actors:	Instructor		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Instructor go in the create exercise section from the dashboard of the system to create new exercise for the student.		
Preconditions:	The instructor needs to fill out the specific fields in the create exercise section.		
Post conditions:	Once the exercise field is filled the exercise will be created.		
Normal Flow (primary scenario):	This use case starts when the go in to the create exercise section. Once the exercise is created it will be forwarded to the student.		

Table 11Set Deadline:

Use Case ID:	3		
Use Case Name:	Set Deadline		
Actors:	Instructor		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Instructor will set the deadline of the exercises which is created and can also extend the deadline.		
Preconditions:	The instructor needs to create the exercise in the create Exercise section.		
Post conditions:	Once the deadline is set it will assign to the exercise and student can see it on their panel.		
Normal Flow (primary scenario):	This use case starts when the Instructor goes in to the set deadline section from the dashboard. The instructor will create deadlines for the exercises which will be stored into the database and when the student login from their panel they will look at it.		

Table 12Evaluate Plans:

Use Case ID:	4		
Use Case Name:	Create New Exercise		
Actors:	Instructor		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Instructor will evaluate the exercise which is created and see in the Evaluate plan section.		
Preconditions:	The instructor needs to create the Exercise and set deadline.		

Post conditions:	Once the plan is evaluated the Instructor final the exercise for the student.
Normal Flow (primary scenario):	This use case starts when the Instructor go in to the evaluate plan section from the dashboard. The instructor evaluates the plan which is developed if the plan is right it will be finalized otherwise the instructor will edit the plans.

Table 13Set the Narratives:

Use Case ID:	5		
Use Case Name:	Set the Narrative		
Actors:	Instructor		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Instructor go in the narrative section from the dashboard of the system to set the narrative for the exercise.		
Preconditions:	The instructor writes the narrative for the plan.		
Post conditions:	Once the narrative is written it will set to the exercise as per the plan.		
Normal Flow (primary scenario):	This use case starts when the Instructor goes into the narrative section. The instructor set the narrative as per the plan and assign it to different point which will clarify the student regarding the exercise.		
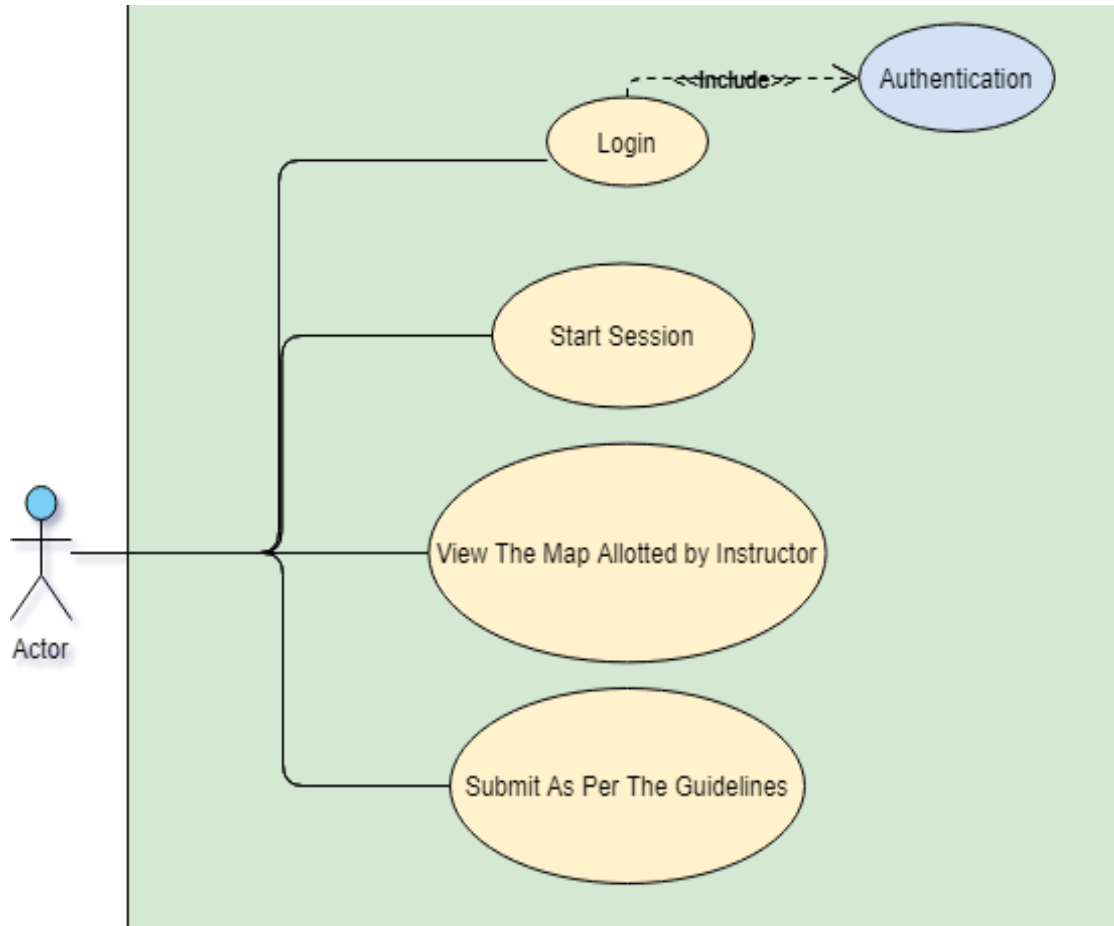
Figure 7: Use Case Diagram - Student

Table 14: Use Case Student Overview

Actors	Use cases
Student	1. Login 2. Start Session 3. View the Map allotted by Instructor 4. Submit as per the guidelines

Table 15:Login:

Use Case ID:	1
Use Case Name:	Login

Actors:	Student		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Student logins to the system by entering credentials		
Preconditions:	The Student should be registered.		
Post conditions:	When the right credentials in put in the field of log in page the Student directed to the Dashboard.		
Normal Flow (primary scenario):	This Student case start when the Student login to the system. Through the login page.		
Alternative Flows:	If the Student enters an invalid name and/or password, the system displays an error message. The Student remains on the login page.		

Table 16:<u>Start Session:</u>

Use Case ID:	2		
Use Case Name:	Start Session		
Actors:	Student		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The Student directed to the Dashboard after login their session will be start.		
Preconditions:	The student need to login to the system.		
Post conditions:	When the session starts in the start session section count down will start of the exercise.		
Normal Flow (primary scenario):	This use case starts when the student login to the system and goes to the start session section to start the task once the session is start, they will get the instructions of the exercise.		

Table 17:<u>View the Map Allotted by Instructor:</u>

Use Case ID:	3		
Use Case Name:	View the Map Allotted by Instructor		
Actors:	Student		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	The student in this section can see the map which is allotted by the Instructor for the Exercise.		
Preconditions:	The Map is Allotted by the Instructor.		
Post conditions:	When the Student View the map which is allotted to them they can start there Exercise.		
Normal Flow (primary scenario):	This use case starts when the Student view the Map in the Map section where the exercise will be held as per the map what are the Instructions.		

Table 18:<u>Submit As per the Guidelines:</u>

Use Case ID:	4		
Use Case Name:	Submit as per the Guidelines		
Actors:	Student		
Created By:	XYZ	Last Updated By:	XYZ
Date Created:	20/03/2021	Date Last Updated:	20/03/2021
Description:	Once the Student go through with all the requirements he or she should confirm that everything is understood by them.		
Preconditions:	Everything should be given plans exercise map etc.		
Post conditions:	When they submitted the confirmation, they will go to the Exercise.		

Normal Flow (primary scenario):	This use case starts when they acknowledge the information and confirm everything that they have seen everything regarding with the Exercise.

5.1.4. Sequence Diagrams

5.1.4.1. Login-Success & Failure:
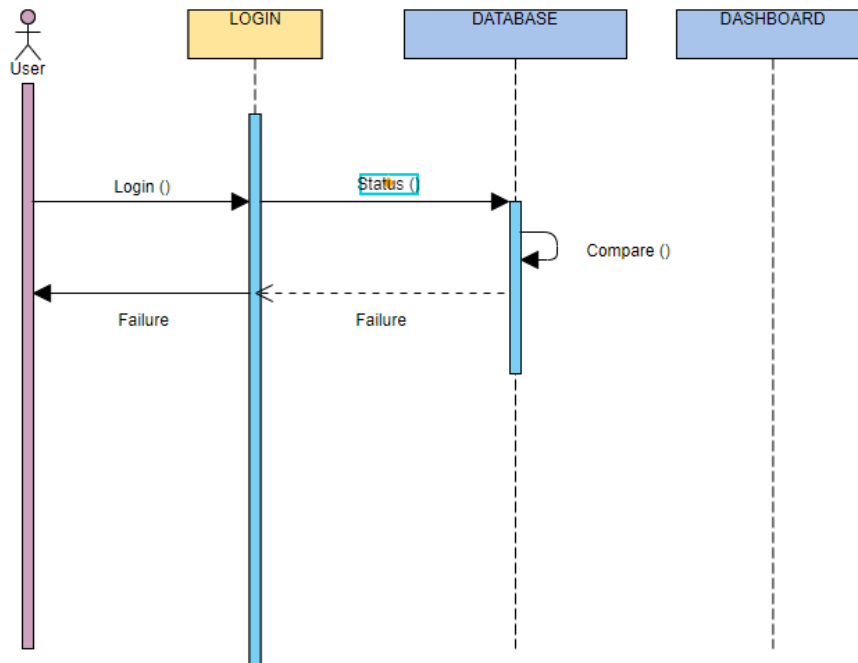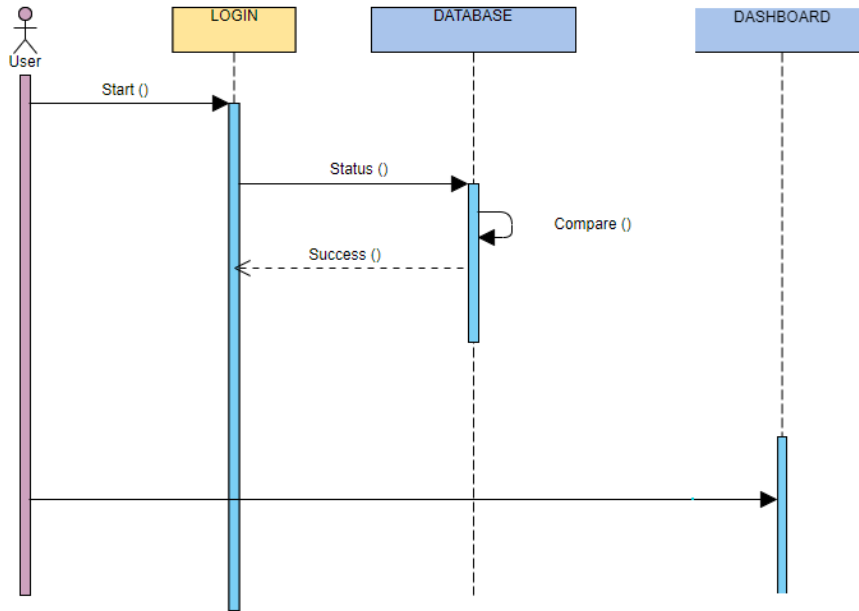
5.1.4.2. Admin Panel:
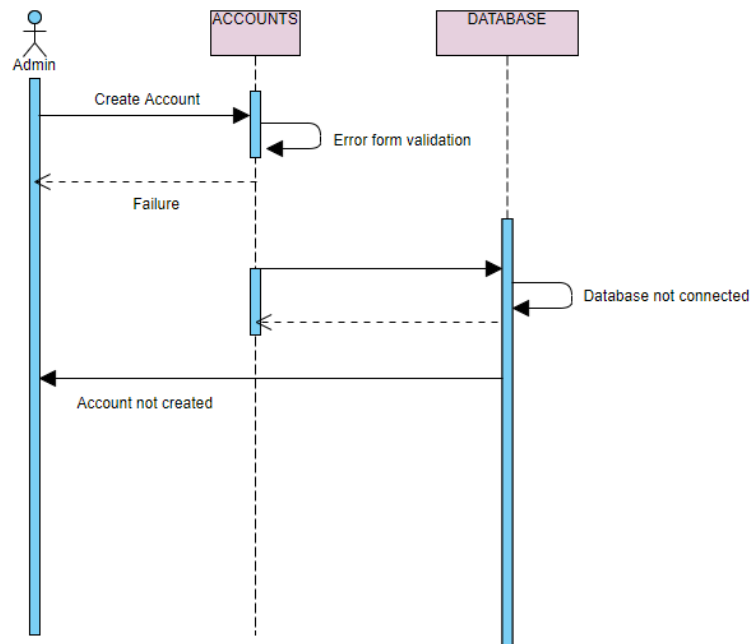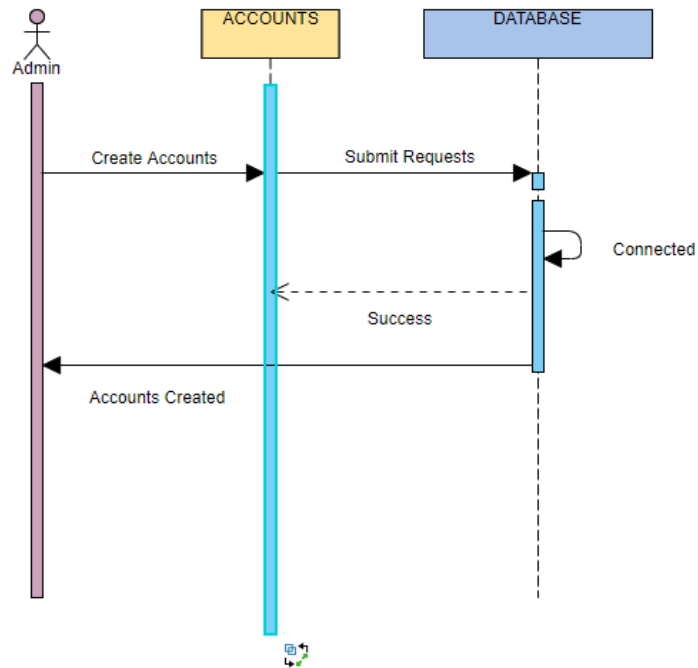
5.1.4.3. Instructor Create Exercise Success and Failure:
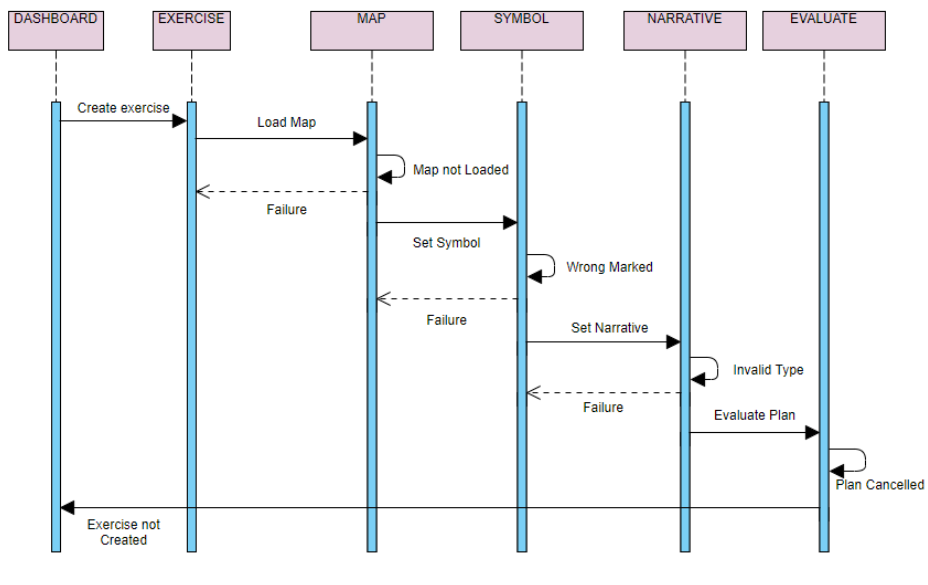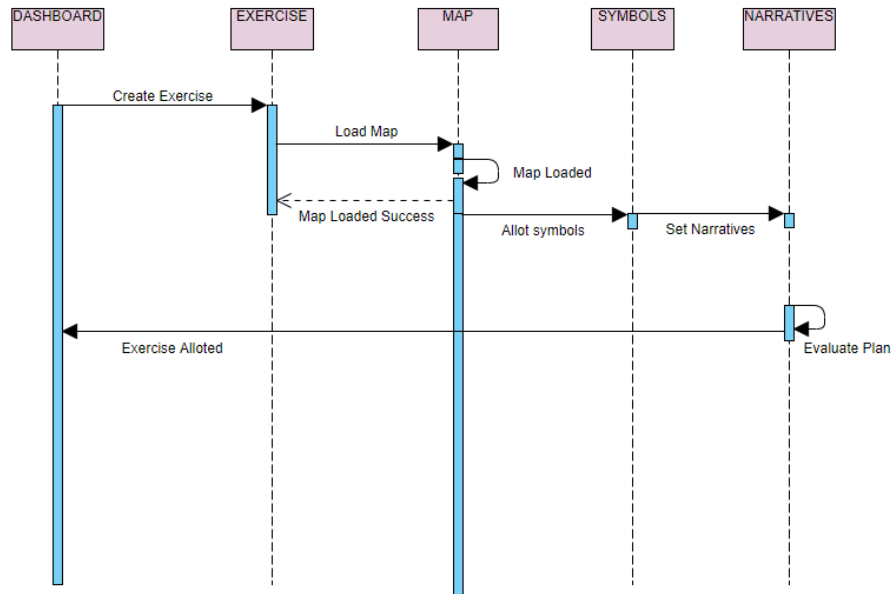
5.1.4.4. Student View Exercise Success and Failure:
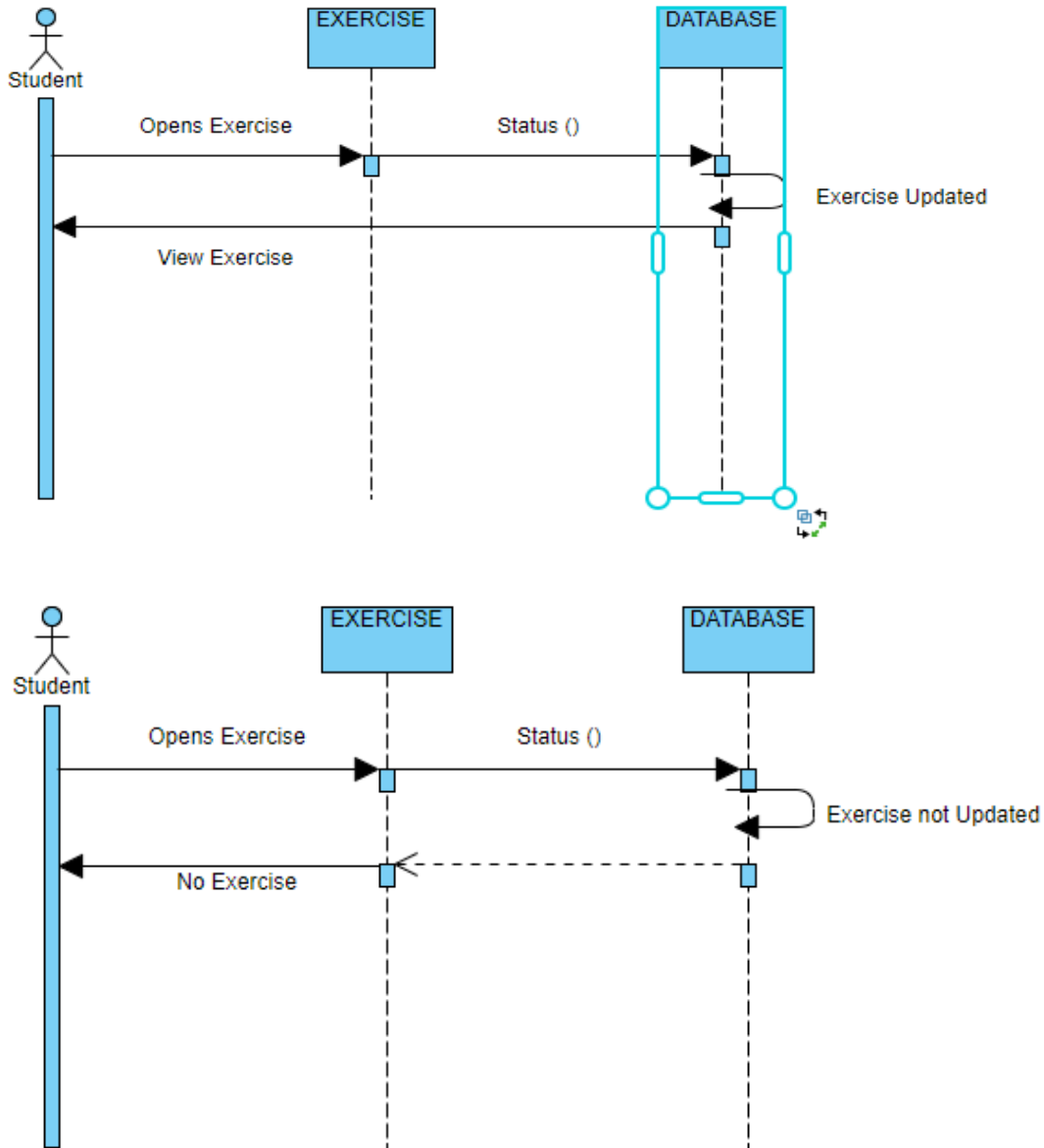
5.1.5. Activity Diagrams

The activity diagram below defines all the stream of activities a user can execute. A user needs to login to use the application.
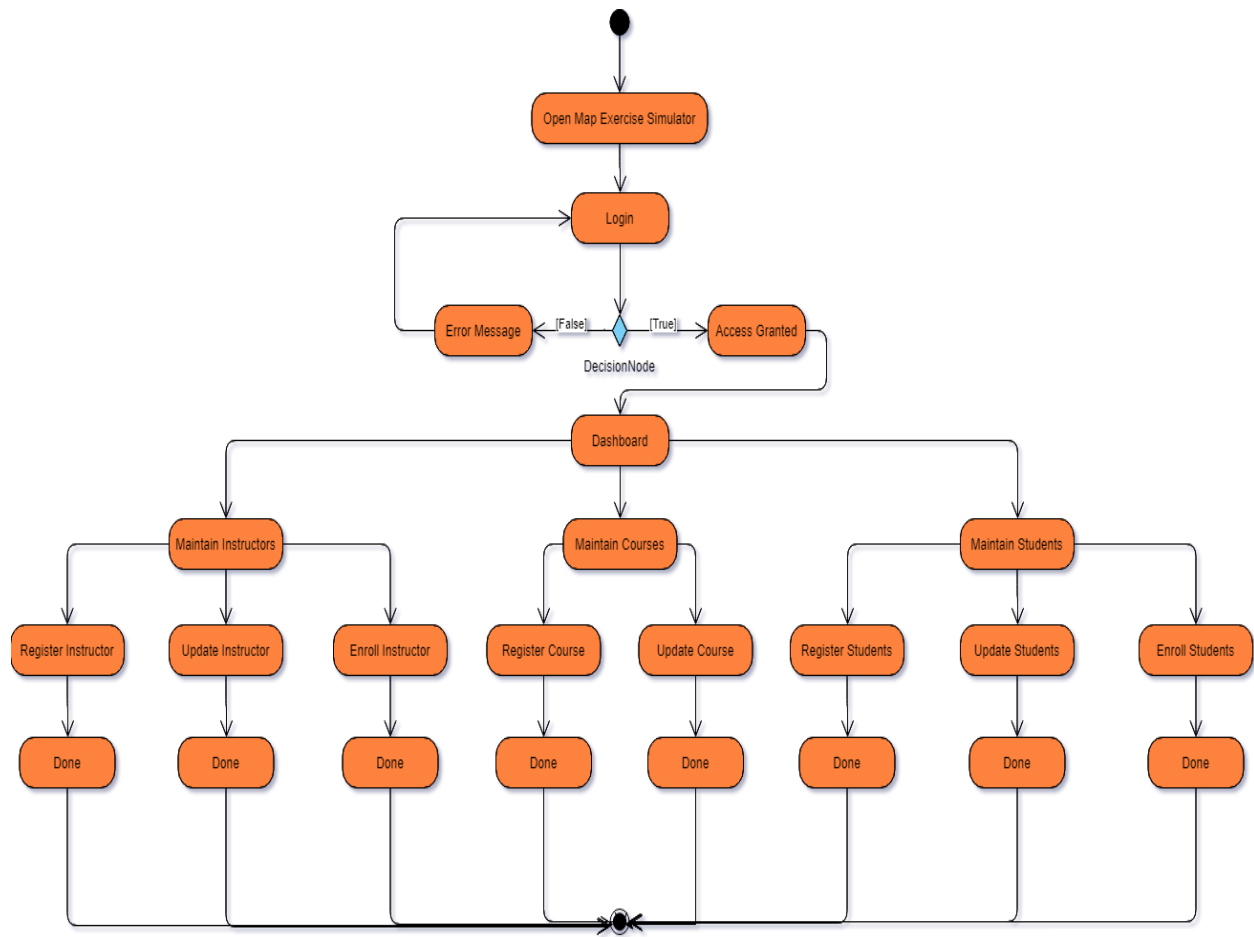
Figure 8: Activity Diagram - Admin
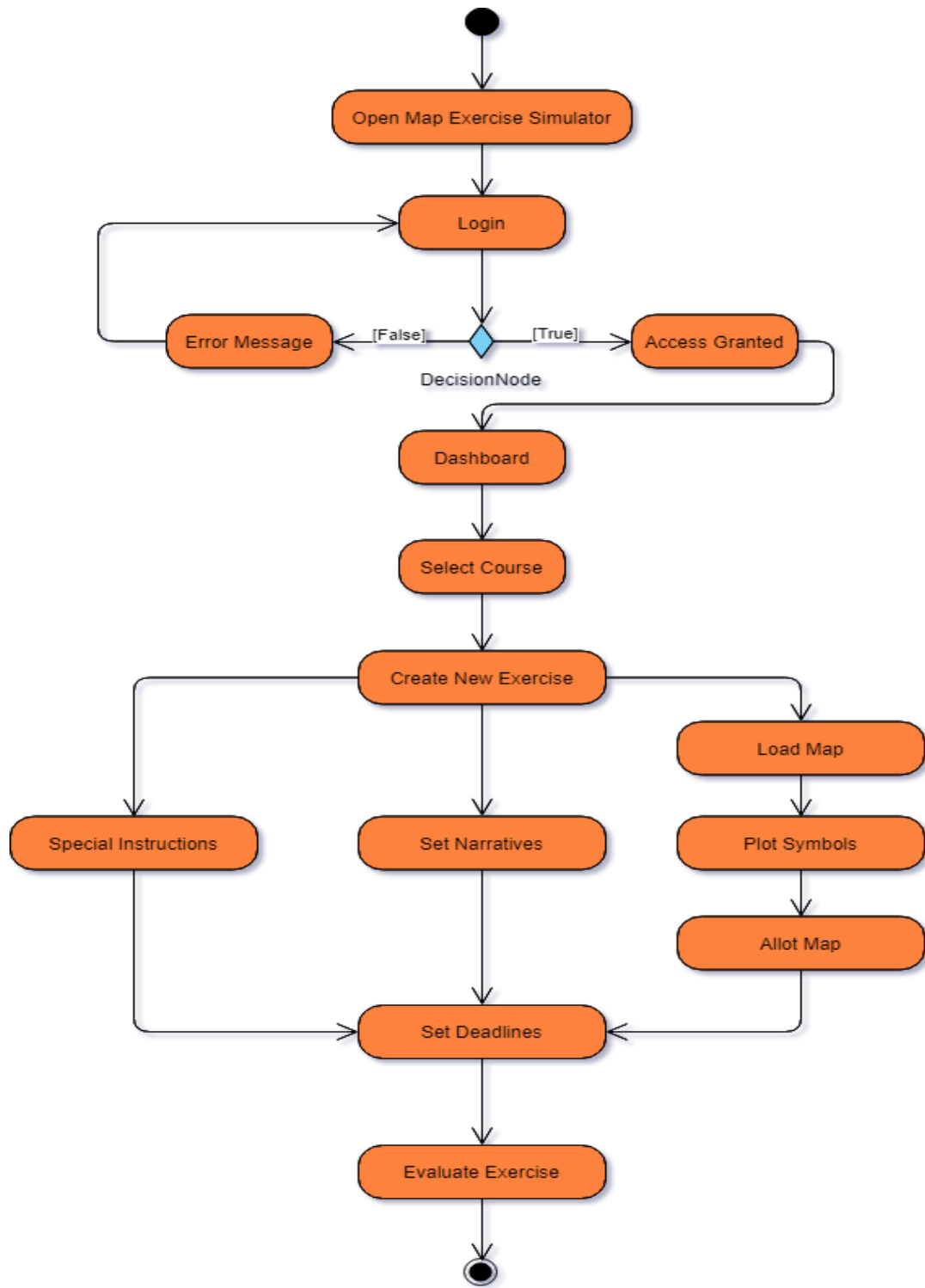
Figure 9: Activity Diagram – Instructor
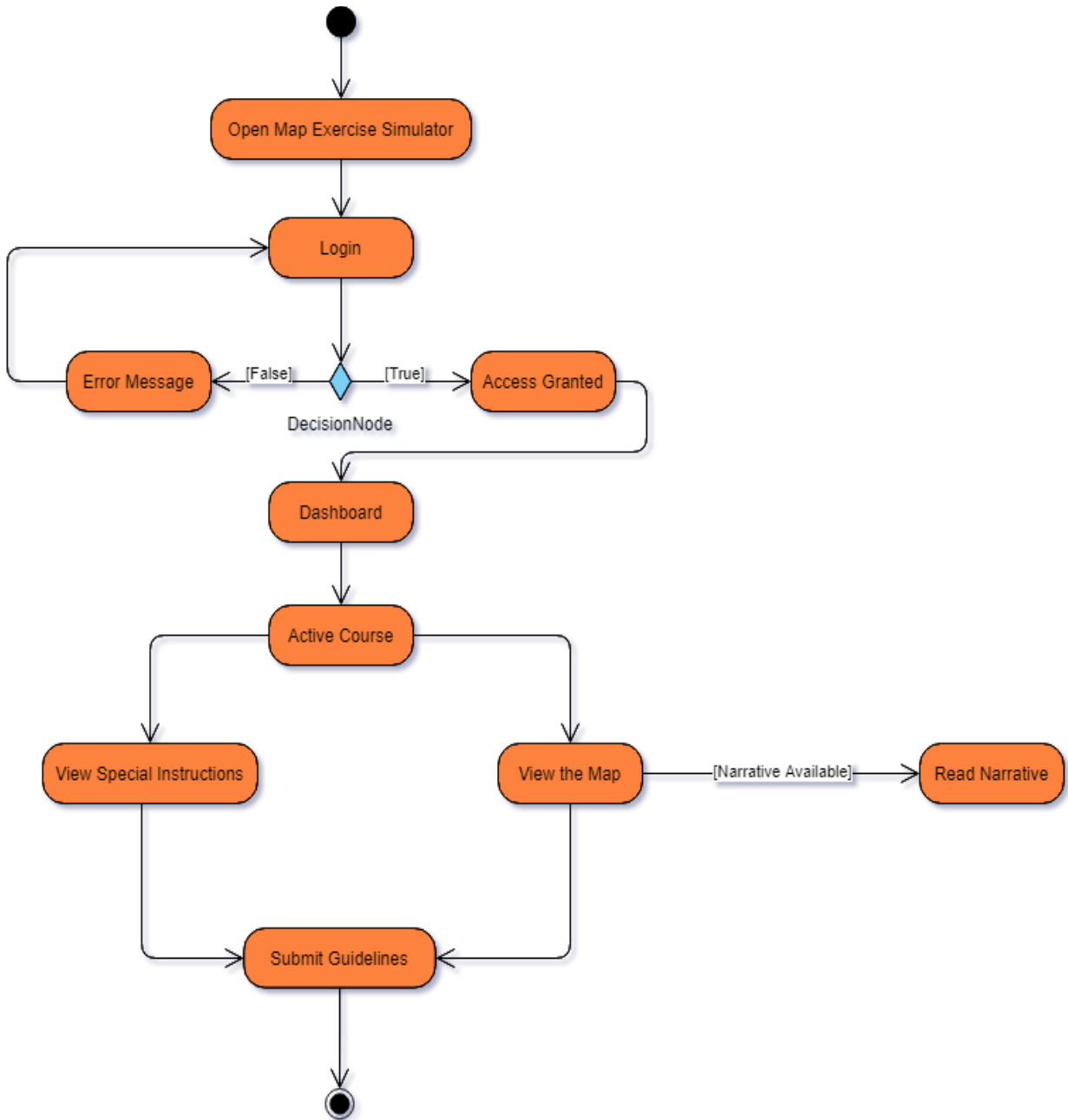
Figure 10: Activity Diagram – Student

5.1.6. Design Rationale

The layered architecture design is a strong broadly useful example, making it a decent beginning stage for most applications, especially when you don't know what architecture design is most appropriate for your application. In any case, there are a few interesting points from a architecture design viewpoint while picking the pattern.

The main thing to keep an eye out for is what is known as the architecture sinkhole anti-pattern. This anti-pattern depicts the circumstance where solicitations course through different layers of the design as straightforward go through preparing with practically zero rationale performed inside each layer. For instance, accept the introduction layer reacts to a solicitation from the client to recover client information. The introduction layer passes the solicitation to the business layer, which essentially passes the solicitation to the constancy layer, which at that point makes a basic SQL call to the database layer to recover the client information. The information is then passed right back up the stack with no extra handling or rationale to total, compute, or change the information.

Each layered architecture will have probably a few situations that fall into the design sinkhole hostile to design. The key, be that as it may, is to examine the level of solicitations that fall into this classification. The 80-20 standard is normally a decent practice to follow to decide if you are encountering the design sinkhole against design. It is commonplace to have around 20 percent of the solicitations as straightforward go through preparing and 80 percent of the solicitations having some business rationale related with the solicitation. In any case, in the event that you find that this proportion is switched and a dominant part of your solicitations are basic go through handling, you should consider making a portion of the design layers open, remembering that it will be progressively hard to control change because of the absence of layer confinement.

Another thought with the layered design is that it will in general loan itself toward solid applications, regardless of whether you split the introduction layer and business layers into isolated deployable units. While this may not be a worry for certain applications, it represents some expected issues as far as sending, general strength and dependability, execution, and versatility.

Chapter 6

6.1. System Implementation

6.1.1. Technology Used

We have used WinForms and User Controls to develop this Application.

6.1.2. Programming Language Used

This Application is developed in C# by using .Net Framework.

6.1.3. Development Tools

This Application is developed using Visual Studio and MySQL Database.

6.1.4. Database

MySQL database has been used for handling all the data storing, retrieval and fetching.

6.2. Operating System

This Application will Require Windows Operating System to run.

6.3. Complete System Implementation

The System contains three primary Panels: Admin, Students and Instructors. The significant module of the Application is administrator who can create, update, delete instructors and students.Admin can likewise perform CRUD operations on courses section.

6.3.1. Choose Instructors

This module provides the interface to Instructors belonging from different subjects where they can create multiple exercises for students and assign an activity to them.

An activity is actually based in the form of Screenshot or Picture. Instructor Click on Map Button to Make an activity for students where he can mark start and end points with the help of given button and create a route between these points.

Instructor is also able to mark pin points on specific area with the help of marker buttons given there and he can also remove the markers and routes by clicking the Remove Overlay button.

He further takes screenshots by clicking the Save Static Map Button.

All the buttons are seeing below:

As mentioned above about the creation of exercises, Instructors are able to create and upload different exercises with its deadline.
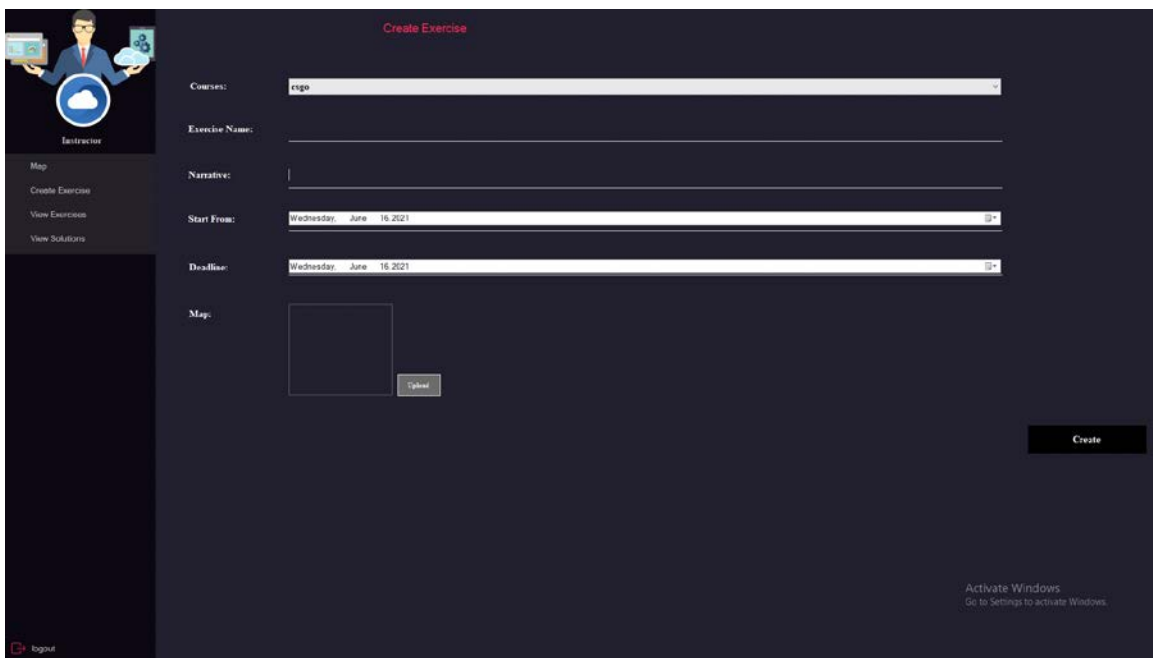
Instructors are able to view all Exercises and Solutions of submitted results which are uploaded by students.
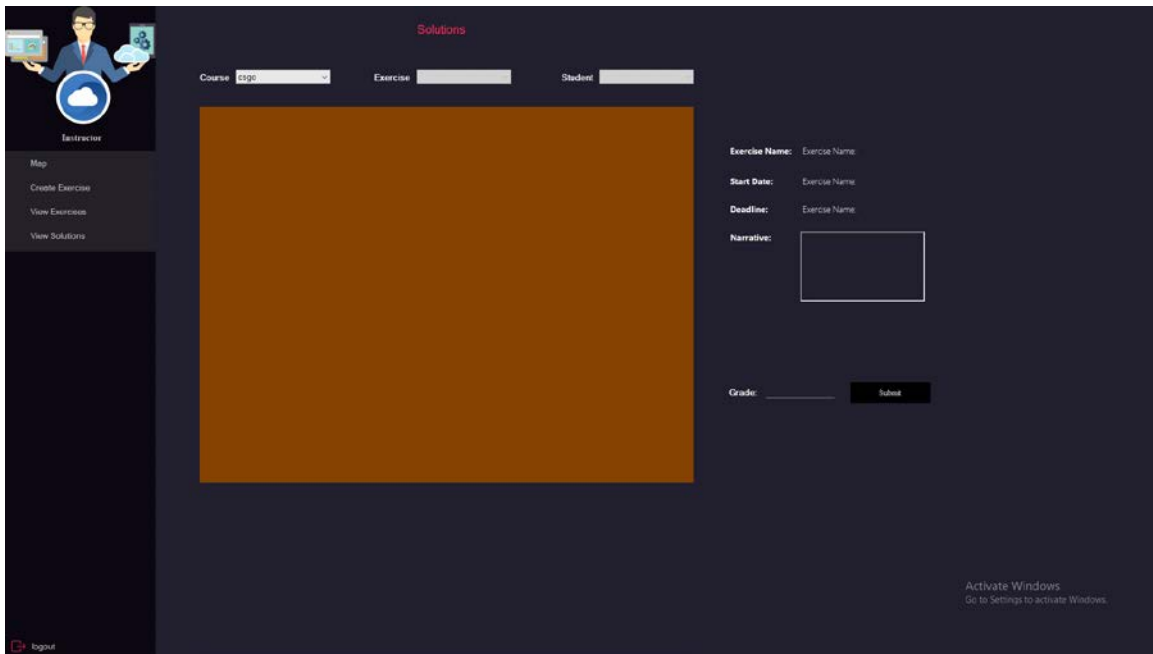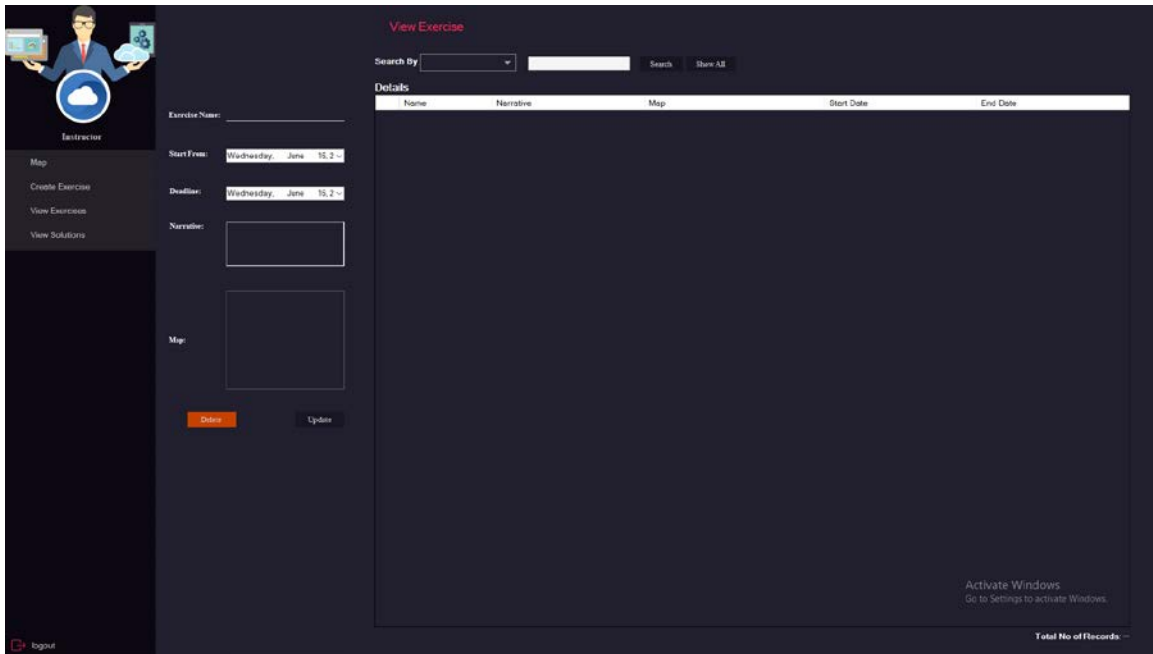
6.3.1.1. Login Module

This is the Login Page where Username and password are mandatory in order to proceed for desired interface.

Login page is categorized with three different users including admin, instructor and Student.

Admin	Instructor	Student

Admin ID _____

Password _____

Login
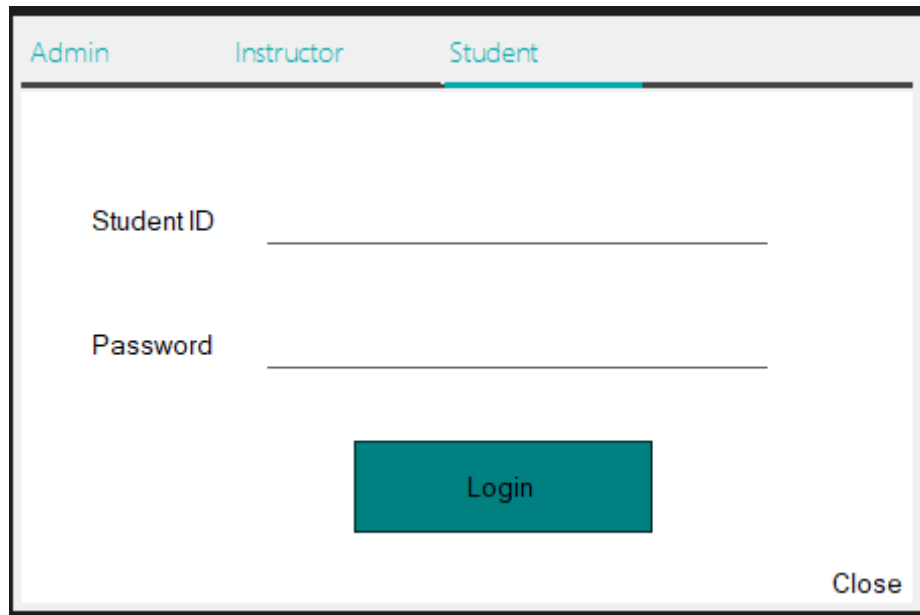
Close

Admin	Instructor	Student

Instructor ID _____

Password _____

Login

Close

Figure 11 Login Module

6.3.2. Student Dashboard

This is the Student Interface where students can view and download their exercises according to different subjects which are uploaded by instructors. Later on, students upload and update their solutions as well.

In this interface students are able to view the grades of their submitted assignments once they are checked and uploaded by instructors.
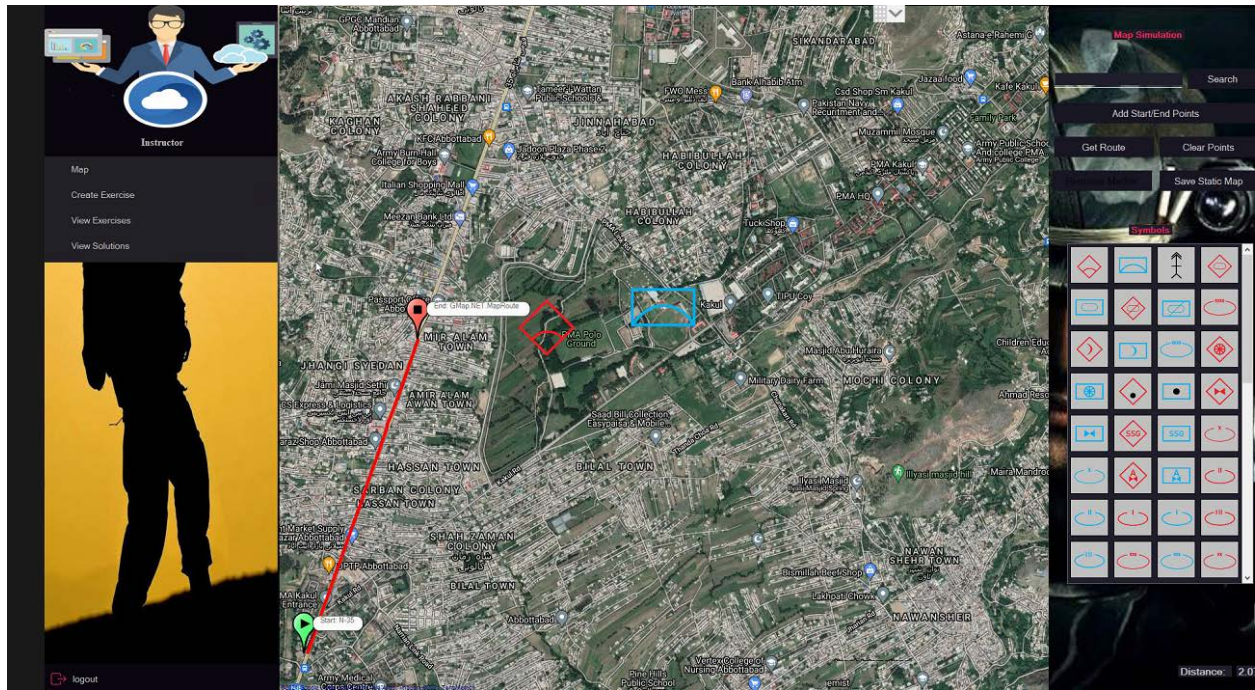
Figure 12: Student Dashboard

Chapter 7

7.1 System Implementation

7.1.1 Overview

Testing of software projects include different levels of testing to ensure that the software which is being developed is error and fault free. The different levels at which testing was performed is argued here.

7.1.2 Unit Testing

It includes the testing of each module at completion.

7.1.3 Test cases for Map Exercise Simulator

Requirement Reference	1	Project Name	MES
Test Case Id	1.1	Test Type	GUI
Test Case Description	To test that there should be two fields on Login screen, namely Login Id and Password		
Test Steps	Double click or open the application		
Expected Result	• Login screen should be displayed showing Login Id and Password fields. • Spelling of labels should be correct.		
Actual Result	Works as mentioned in expected result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	1	Project Name	MES
Test Case Id	1.2	Test Type	GUI
Test Case Description	In this test case when opening login screen there is Login Button on screen, namely Login		
Test Steps	Double click to open the application		
Expected Result	• Login screen displays one button, namely Login		

	• Spelling of buttons is correct.		
Actual Result	There is button as mentioned in expected result namely Login.		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	1	**Project Name**	MES
Test Case Id	1.3	**Test Type**	GUI
Test Case Description	In this Test Case Login Screen can be logged in by three users ; Admin,Instructors And Students.		
Test Steps	• Double click or open the application		
Expected Result	• Individual User can easily be logged through his Id and Password		
Actual Result	System allows validate user to enter inside the dashboard		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	1	**Project Name**	MES
Test Case Id	1.4	**Test Type**	GUI
Test Case Description	The Password field should be of encrypted type		
Test Steps	• Double click or open the application		
Expected Result	• System doesn't allow user to show the password.		
Actual Result	Actual result same as expected result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		

Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.1	**Test Type**	Admin Panel
Test Case Description	In this Test Case it Displays the dashboard of Admin Panel		
Test Steps	• Once Admin gets Logged in. • Should be verified through given credentials		
Expected Result	• System should open next screen / dashboard		
Actual Result	Display DashBoard After logged in		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2	**Test Type**	Admin Panel
Test Case Description	In this Test Case it Displays the dashboard with four main buttons of Admin Panel		
Test Steps	• Once Admin gets Logged in. • Should be verified through given credentials		
Expected Result	System Displays 4 Main Buttons; Student , Instructor,Maintain Courses and Logout Buttons.		
Actual Result	Actual Result matches with the expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		

Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1	**Test Type**	Student Button
Test Case Description	This Student Button has Five more sub buttons ; Add,Remove,Enroll,Update and View		
Test Steps	• Click on Student Button		
Expected Result	5 More Buttons appear when clicking Student Button.		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.1	**Test Type**	Add Button
Test Case Description	New more window Opens when Clicking Add button which displays Several Fileds ; ID, Name,Password,Email and Gender Including two Buttons ; Clear and Add Student.		
Test Steps	• Click on Add button		
Expected Result	• System Displays new window with Several Fields and two Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement	2	**Project Name**	MES

Reference			
Test Case Id	2.2.1.1.1	**Test Type**	Add Button
Test Case Description	In this Test Case when Clicking Add button Gender has Radio Button Option ; Male and Female		
Test Steps	• Click on Add button		
Expected Result	• System Displays Radio Button Options in Add Student Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.1.2	**Test Type**	Clear Button
Test Case Description	In this Test Case when Clicking Clear Button It clears All written Data from the Text Fields.		
Test Steps	• Click on Clear button		
Expected Result	• System Displays Clear Button in Add Student Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.1.3	**Test Type**	Add Student Button
Test Case Description	In this Test Case when Clicking Add Student Button It Adds the data written in the Text Fields with Gender Specific in the database.		
Test Steps	• Click on Add Student button		
Expected Result	• System Displays Add Student Button in Add Student Panel		

Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.2	**Test Type**	Remove Button
Test Case Description	New more window Opens when Clicking Remove button which displays Two Fileds ; Select ID and Name including One Button; Remove Student button		
Test Steps	• Click on Remove Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields and One Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.2.1	**Test Type**	SelectId Combo Button
Test Case Description	In this Test Case when Clicking Remove Button It Displays the Select Id Combo Button which Displays the Student Ids Automatically		
Test Steps	• Click on Remove Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields ;SelectId ,Name and One Remove Student Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		

Tested By	Adnan Hamid

Requirement Reference	2	Project Name	MES
Test Case Id	2.2.1.2.2	Test Type	Remove Student Button
Test Case Description	In this Test Case when Clicking Remove Student Button It Deletes the Specific Studentm having Selected Id.		
Test Steps	• Click on Remove Student Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields ;SelectId ,Name and One Remove Student Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	Project Name	MES
Test Case Id	2.2.1.3	Test Type	Enroll Button
Test Case Description	New window Opens when Clicking Enroll button which displays Three Fields ; Select ID ,Name and Course Name including One Enroll Button		
Test Steps	• Click on Enroll Button Showing on Admin Panel		
Expected Result	• System Displays new window with Three Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	Project Name	MES

Test Case Id	2.2.1.3.1	Test Type	SelectId Combo Button
Test Case Description	In this Test Case when Clicking Enroll Button It Displays the Select Id Combo Button which Displays the Student Ids Automatically		
Test Steps	• Click on Enroll Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Three Fields ;SelectId ,Name,Course Name and One Enroll Student Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	Project Name	MES
Test Case Id	2.2.1.3.2	Test Type	CourseName Combo Button
Test Case Description	In this Test Case when Clicking Enroll Button It Displays the CourseName Combo Button which Displays the Course Name Automatically		
Test Steps	• Click on Enroll Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Three Fields ;SelectId ,Name,Course Name and One Enroll Student Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	Project Name	MES
Test Case Id	2.2.1.3.3	Test Type	Enroll Button
Test Case Description	In this Test Case when Clicking Enroll Student Button It Enrolss the Specific Studentm having Selected Id.		

Test Steps	• Click on Enroll Button Appearing Enroll Student Form
Expected Result	• System Displays Three Fields ;SelectId ,Name, Course Name and One Enroll Student Button
Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.4	**Test Type**	Update Button
Test Case Description	New window Opens when Clicking Update button which displays Six Fields ; ID ,Name,Password, Email, Gender, Update Course including One Update Button		
Test Steps	• Click on Update Button Showing on Admin Panel		
Expected Result	• System Displays new window with Six Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.4.1	**Test Type**	Id Combo Button
Test Case Description	In this Test Case when Clicking Update Button It Displays the Id Combo Button which Displays the Student Ids Automatically		
Test Steps	• Click on Update Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Six Fields ;; ID ,Name,Password, Email, Gender, Update Course including One Update Button		
Actual Result	Actual Result Matches Expected Result		

Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.4.2	**Test Type**	Radio Button
Test Case Description	In this Test Case when Clicking Add button Gender has Radio Button Option ; Male and Female		
Test Steps	• Click on Update button		
Expected Result	• System Displays Radio Button Options in Update Student Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES
Test Case Id	2.2.1.4.3	**Test Type**	Update Button
Test Case Description	In this Test Case when Clicking Update Student Button It Updates the Specific Student having Selected Id.		
Test Steps	• Click on Update Button Appearing Update Student Form		
Expected Result	• System Displays new window with Six Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	2	**Project Name**	MES

Test Case Id	2.2.1.5	Test Type	View Button
Test Case Description	New window Opens when Clicking View button which displays 5 Fields including DataGridView Where Admin can Search Specific Student by his password ,name and ID.		
Test Steps	• Click on View Button Showing on Admin Panel		
Expected Result	• System Displays new window with Five Fields and DatagridView		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2	Test Type	Instructor Button
Test Case Description	This Instructor Button has Five more sub buttons ; Add,Remove,Enroll,Update and View		
Test Steps	• Click on Instructor Button		
Expected Result	5 More Buttons appear when clicking Instructor Button.		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.1	Test Type	Add Button
Test Case Description	New more window Opens when Clicking Add button which displays Several Fileds ; ID, Name,Password,Email and Gender Including two Buttons ; Clear and Add Instructor .		
Test Steps	• Click on Add button		
Expected Result	• System Displays new window with Several Fields and two Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.1.1	Test Type	Add Button
Test Case Description	In this Test Case when Clicking Add button Gender has Radio Button Option ; Male and Female		
Test Steps	• Click on Add button		
Expected Result	• System Displays Radio Button Options in Add Instructor Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.1.2	Test Type	Clear Button
Test Case Description	In this Test Case when Clicking Clear Button It clears All written Data from the Text Fields.		
Test Steps	• Click on Clear button		
Expected Result	• System Displays Clear Button in Add Instructor Panel		

Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.1.3	**Test Type**	Add Instructor Button
Test Case Description	In this Test Case when Clicking Add Instructor Button It Adds the data written in the Text Fields with Gender Specific in the database.		
Test Steps	• Click on Add Instructor button		
Expected Result	• System Displays Add Instructor Button in Add Instructor Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.2	**Test Type**	Remove Button
Test Case Description	New more window Opens when Clicking Remove button which displays Two Fileds ; Select ID and Name including One Button; Remove Instructor button		
Test Steps	• Click on Remove Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields and One Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		

Tested By	Adnan Hamid

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.2.1	Test Type	SelectId Combo Button
Test Case Description	In this Test Case when Clicking Remove Button It Displays the Select Id Combo Button which Displays the Instructor Ids Automatically		
Test Steps	• Click on Remove Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields ;SelectId ,Name and One Remove Instructor Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.2.2	Test Type	Remove Instructor Button
Test Case Description	In this Test Case when Clicking Remove Instructor Button It Deletes the Specific Instructor having Selected Id.		
Test Steps	• Click on Remove Instructor Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields ;SelectId ,Name and One Remove Instructor Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement	3	Project Name	MES

Reference			
Test Case Id	3.2.2.3	**Test Type**	Enroll Button
Test Case Description	New window Opens when Clicking Enroll button which displays Three Fields ; Select ID ,Name and Course Name including One Enroll Button		
Test Steps	• Click on Enroll Button Showing on Admin Panel		
Expected Result	• System Displays new window with Three Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.3.1	**Test Type**	SelectId Combo Button
Test Case Description	In this Test Case when Clicking Enroll Button It Displays the Select Id Combo Button which Displays the Instructor Ids Automatically		
Test Steps	• Click on Enroll Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Three Fields ;SelectId ,Name,Course Name and One Enroll Instructor Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.3.2	**Test Type**	CourseName Combo Button
Test Case Description	In this Test Case when Clicking Enroll Button It Displays the CourseName Combo Button which Displays the Course		

	Name Automatically
Test Steps	• Click on Enroll Button Appearing on Admin Panel
Expected Result	• System Displays new window with Three Fields ;SelectId ,Name,Course Name and One Enroll Instructor Button
Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.3.3	**Test Type**	Enroll Button
Test Case Description	In this Test Case when Clicking Enroll Instructor Button It Enrolss the Specific Instructor having Selected Id.		
Test Steps	• Click on Enroll Button Appearing Enroll Instructor Form		
Expected Result	• System Displays Three Fields ;SelectId ,Name, Course Name and One Enroll Instructor Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	**Project Name**	MES
Test Case Id	3.2.2.4	**Test Type**	Update Button
Test Case Description	New window Opens when Clicking Update button which displays Six Fields ; ID ,Name,Password, Email, Gender, Update Course including One Update Button		
Test Steps	• Click on Update Button Showing on Admin Panel		
Expected Result	• System Displays new window with Six Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		

Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.4.1	Test Type	Id Combo Button
Test Case Description	In this Test Case when Clicking Update Button It Displays the Id Combo Button which Displays the Instructor Ids Automatically		
Test Steps	• Click on Update Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Six Fields ;; ID ,Name,Password, Email, Gender, Update Course including One Update Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.4.2	Test Type	Radio Button
Test Case Description	In this Test Case when Clicking Add button Gender has Radio Button Option ; Male and Female		
Test Steps	• Click on Update button		
Expected Result	• System Displays Radio Button Options in Update Instructor Panel		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.4.3	Test Type	Update Button
Test Case Description	In this Test Case when Clicking Update Instructor Button It Updates the Specific Instructor having Selected Id.		
Test Steps	• Click on Update Button Appearing Update Instructor Form		
Expected Result	• System Displays new window with Six Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	3	Project Name	MES
Test Case Id	3.2.2.5	Test Type	View Button
Test Case Description	New window Opens when Clicking View button which displays 5 Fields including DataGridView Where Admin can Search Specific Instructor by his password ,name and ID.		
Test Steps	• Click on View Button Showing on Admin Panel		
Expected Result	• System Displays new window with Five Fields and DatagridView		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	4	Project Name	MES
Test Case Id	4.2.2	Test Type	Maintain Course Button
Test Case Description	This Instructor Button has Four more sub buttons ;		

	Add,Delete,Update and View
Test Steps	• Click on Maintain Course Button
Expected Result	Four More Buttons appear when clicking Maintain Course Button.
Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	4	**Project Name**	MES
Test Case Id	4.2.2.1	**Test Type**	Add Button
Test Case Description	New more window Opens when Clicking Add button which displays Several Fileds ; ID, Name and Details Including two Buttons ; Clear and Add Course .		
Test Steps	• Click on Add button		
Expected Result	• System Displays new window with Several Fields and two Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	4	**Project Name**	MES
Test Case Id	4.2.2.2	**Test Type**	Delete Button
Test Case Description	New more window Opens when Clicking Delete button which displays Two Fileds ; Select ID and Name including One Button; Remove Course button		
Test Steps	• Click on Remove Button Appearing on Admin Panel		
Expected Result	• System Displays new window with Two Fields and One Buttons		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		

Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	4	**Project Name**	MES
Test Case Id	4.2.2.3	**Test Type**	Update Button
Test Case Description	In this Test Case when Clicking Update Course Button It Updates the Specific Course having Selected Id.		
Test Steps	• Click on Update Button Appearing Update Course Form		
Expected Result	• System Displays new window with Four Fields and One Button		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	4	**Project Name**	MES
Test Case Id	4.2.2.4	**Test Type**	View Button
Test Case Description	New window Opens when Clicking View button which displays 5 Fields including DataGridView Where Admin can Search Specific Instructor by his password ,name and ID.		
Test Steps	• Click on View Button Showing on Admin Panel		
Expected Result	• System Displays new window with Five Fields and DatagridView		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	5	Project Name	MES
Test Case Id	5.1	Test Type	Student Panel
Test Case Description	In this Test Case it Displays the dashboard of Student Panel		
Test Steps	• Once Student gets Logged in. • Should be verified through given credentials		
Expected Result	• System should open next screen / dashboard		
Actual Result	Display Dashboard After logged in		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	5	Project Name	MES
Test Case Id	5.2	Test Type	Student Panel
Test Case Description	In this Test Case it Displays the dashboard with two main buttons of Student Panel		
Test Steps	• Once Student gets Logged in. • Should be verified through given credentials		
Expected Result	System Displays 2 Main Buttons; View Exercise and View Courses		
Actual Result	Actual Result matches with the expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	5	Project Name	MES
Test Case Id	5.2.1	Test Type	View Exercise

			Button
Test Case Description	This View Exercise Button Displays 6 Fields, two Buttons,Search Bar and DataGridView which display all Exercise plans Accordinly		
Test Steps	• Click on View Exercise Button		
Expected Result	System Displays 2 Main Buttons; View Exercise and View Courses		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	5	**Project Name**	MES
Test Case Id	5.2.1	**Test Type**	View Grades Button
Test Case Description	This View Exercise Button Displays 5 Fields, two Combo box Buttons and Picture Box which display all Exercise plans Accordinly		
Test Steps	• Click on View Exercise Button		
Expected Result	System Displays 2 Main Buttons; View Exercise and View Courses		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	6	**Project Name**	MES
Test Case Id	6.2	**Test Type**	Instructor Panel
Test Case Description	In this Test Case it Displays the dashboard with Four main buttons of Instructor Panel		

Test Steps	• Once Instructor gets Logged in. • Should be verified through given credentials
Expected Result	System Displays 4 Main Buttons; Map,CreateExercise and View Exercise and View Solutions
Actual Result	Actual Result matches with the expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	6	**Project Name**	MES
Test Case Id	6.2.1	**Test Type**	Map Panel
Test Case Description	In this Test Case it Displays the Map with Five buttons for Map Simulations and two markers along with Search Bar		
Test Steps	• Once Instructor gets Logged in. • Should be verified through given credentials		
Expected Result	System Displays the Map with Five buttons for Map Simulations and two markers along with Search Bar		
Actual Result	Actual Result matches with the expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	6	**Project Name**	MES
Test Case Id	6.2.2	**Test Type**	Create Exercise Button
Test Case Description	This Create Exercise Button Displays 6 Fields, including 3 Combo box Buttons and Picture Box and 2 buttons ; Upload		

	and create .
Test Steps	• Once Instructor gets Logged in. • Should be verified through given credentials
Expected Result	Displays 6 Fields, including 3 Combo box Buttons and Picture Box and 2 buttons ; Upload and create .
Actual Result	Actual Result matches with the expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Requirement Reference	6	**Project Name**	MES
Test Case Id	6.2.3	**Test Type**	View Exercise Button
Test Case Description	This View Exercise Button Displays 6 Fields, two Buttons,Search Bar and DataGridView which display all Exercise plans Accordinly		
Test Steps	• Click on View Exercise Button		
Expected Result	System Displays 2 Main Buttons; View Exercise and View Courses		
Actual Result	Actual Result Matches Expected Result		
Pass/Fail	Pass		
Date Prepared	June 18 2021		
Date Run	June 18 2021		
Prepared By	Adnan Hamid		
Tested By	Adnan Hamid		

Requirement Reference	6	**Project Name**	MES
Test Case Id	6.2.3	**Test Type**	View Solutions Button
Test Case	This View Solutions Button Displays 5 Fields, three Combo		

Description	box Buttons,Picture Box to view Solution and Submit Button.
Test Steps	• Click on View Solutions Button
Expected Result	System DisplaysDisplays 5 Fields, three Combo box Buttons,Picture Box to view Solution and Submit Button.
Actual Result	Actual Result Matches Expected Result
Pass/Fail	Pass
Date Prepared	June 18 2021
Date Run	June 18 2021
Prepared By	Adnan Hamid
Tested By	Adnan Hamid

Chapter 8

8.1. Conclusion and Future Work
8.1.1. Conclusion

Our goal was to develop a learning management system that finds an innovative bridge between Instructors and Students. A system needs to be developed that will allow students to learn and explore different approaches of learning by attempting exercises from a remote area using their interface.

We accomplished our objectives, successfully developing this Application that let Instructors to assign exercises to students.

Due to constraints of time and team size, the scope of the project was kept small. We firmly believe that our project can genuinely bring about a significant change in learning growth of students.

8.1.2. Future work

Due to certain limits in terms of project development time and team size, a lot of things had to be omitted from the scope of this project. First of all, at the moment the Project caters for any specific learning management. In the future however, functionality could be possibly expanded.

Number of features can be incorporated in the application. Some of them are listed below:

- Its UI can be improved by using various Modern UI Packages. Among minor changes, the applications User Interface could be modified to be even more user friendly and pensive.

- Students will be able to receive notification once the exercise gets uploaded by a specific instructor.

- Students and Instructors will be able to update their password. In case they forget the password, they will be able to recreate their password once they receive code from their mailbox and type the code appropriately in the given field.

- Instructor will view the login history of students whereas admin will also be able to view logged in and logged out sessions of instructors and students.

Glossary

Table 19: Glossary

API	Application Programming Interface
MES	Map Exercise Simulator
App	Application
Black box Testing	Testing emphasizes on the external behavior of the software entity
CO	Constraints
App	Application
CEO	Chief Executive Officer
DBMS	Database Management System
DEP	Dependency
FRs	Functional Requirements
GUI	Graphical User Interface
IDE	Integrated Development Environment
iOS	Mobile Operating System created and developed by Apple
MCS	Military College of Signals
NFRs	Non-Functional Requirements
NUST	National University of Science and Technology
OE	Operating Environment
OS	Operating System

Parse	Cloud Server
REQ	Requirement
SQL	Structured Query Language
SR	Safety Requirements
SRS	Software Requirements Specification
UD	User Documentation
UML	Unified Modelling Language
White Box Testing	Testing emphasizes on the internal behavior of the software entity

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