



**RAJALAKSHMI
ENGINEERING COLLEGE**

An AUTONOMOUS Institution
Affiliated to ANNA UNIVERSITY, Chennai

DEPARTMENT OF INFORMATION TECHNOLOGY

ACADEMIC YEAR 2024-2025

EVEN SEMESTER



CS23432 SOFTWARE CONSTRUCTION LAB

SECOND YEAR

FOURTH SEMESTER

2024- 2025

EVEN SEMESTER

Ex No	List of Experiments
1	Study of Azure DevOps
2	Designing Project using AGILE-SCRUM Methodology.
3	Agile Planning
4	User stories – Creation
5	Architecture Diagram Using AZURE
6	Designing Usecase and Class Diagram
7	Designing Interaction Diagrams
8	Design Interface
9	Implementation – Design a Web Page based on Scrum Methodology
10	Testing using Azure.
11	Deployment

Requirements	
Hardware	Intel i3, CPU @ 1.20GHz 1.19 GHz, 4 GB RAM, 32 Bit Operating System
Software	StarUML , Azure

LAB PLAN

CS19442-SOFTWARE ENGINEERING LAB

Ex No	Date	Topic	Page No	Sign
1		Study of Azure DevOps		
2		Writing Problem Statement		
3		Designing Project using AGILE-SCRUM Methodology by using Azure.		
4		Agile Planning		
5		User stories – Creation		
6		Architecture Diagram Using AZURE		
7		Designing Usecase Diagram using StarUML		
8		Designing Activity Diagrams using StarUML		
9		Designing Sequence Diagrams using StarUML		
10		Design Class Diagram		
10		Design User Interface		
11		Implementation – Design a Web Page based on Scrum Methodology		
12		Testing		
13		Deployment		

Course Outcomes (COs)

Course Name: Software Engineering

Course Code: CS23432

CO 1	Understand the software development process models.
CO 2	Determine the requirements to develop software
CO 3	Apply modeling and modeling languages to design software products
CO 4	Apply various testing techniques and to build a robust software products
CO 5	Manage Software Projects and to understand advanced engineering concepts

CO - PO – PSO matrices of course

PO/PSO CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CS23432.1	2	2	3	2	2	2	2	2	2	2	3	2	1	3	-
CS23432.2	2	3	1	2	2	1	-	1	1	1	2	-	1	2	-
CS23432.3	2	2	1	1	1	1	1	1	1	1	1	1	2	2	1
CS23432.4	2	2	3	2	2	2	1	0	2	2	2	1	1	2	1
CS23432.5	2	2	2	1	1	1	1	0	2	1	1	1	2	1	-
Average	2.0	2.2	2.0	1.6	1.6	1.4	1.3	1.3	1.6	1.4	1.8	1.3	1.4	2.0	1.0

Correlation levels 1, 2 or 3 are as defined below:

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High) No correlation: “-”

EX NO: 1

DATE:

Study of Azure DevOps

AIM:

To study how to create an agile project in Azure DevOps environment.

STUDY:

Azure DevOps is a cloud-based platform by Microsoft that provides tools for DevOps practices, including CI/CD pipelines, version control, agile planning, testing, and monitoring. It supports teams in automating software development and deployment.

1. Understanding Azure DevOps

Azure DevOps consists of five key services:

1.1 Azure Repos (Version Control)

Supports Git repositories and Team Foundation Version Control (TFVC).

Provides features like branching, pull requests, and code reviews.

1.2 Azure Pipelines (CI/CD)

Automates build, test, and deployment processes.

Supports multi-platform builds (Windows, Linux, macOS).

Works with Docker, Kubernetes, Terraform, and cloud providers (Azure, AWS, GCP).

1.3 Azure Boards (Agile Project Management)

Manages work using Kanban boards, Scrum boards, and dashboards.

Tracks user stories, tasks, bugs, sprints, and releases.

1.4 Azure Test Plans (Testing)

Provides manual, exploratory, and automated testing.

Supports test case management and tracking.

1.5 Azure Artifacts (Package Management)

Stores and manages NuGet, npm, Maven, and Python packages.

Enables versioning and secure access to dependencies.

Getting Started with Azure DevOps

Step 1: Create an Azure DevOps Account

Visit Azure DevOps.

Sign in with a Microsoft Account.

Create an Organization and a Project.

Step 2: Set Up a Repository (Azure Repos)

Navigate to Repos.

Choose Git or TFVC for version control.

Clone the repository and push your code.

Step 3: Configure a CI/CD Pipeline (Azure Pipelines)

Go to Pipelines → New Pipeline.

Select a source code repository (Azure Repos, GitHub, etc.).

Define the pipeline using YAML or the Classic Editor.

Run the pipeline to build and deploy the application.

Step 4: Manage Work with Azure Boards

Navigate to Boards.

Create work items, user stories, and tasks.

Organize sprints and track progress.

Step 5: Implement Testing (Azure Test Plans)

Go to Test Plans.

Create and run test cases

View test results and track bugs.

Result:

The study was successfully completed.

EX NO: 2

PROBLEM STATEMENT

AIM:

To prepare PROBLEM STATEMENT for your given project.

Problem Statement:

Evaluation of Academic Performance

Students, teachers, and parents often struggle to track academic performance efficiently due to scattered data and lack of real-time insights. There's a need for a centralized, intelligent system that visualizes grades, identifies trends, and provides actionable feedback, enabling timely interventions to support student success and academic improvement.

Result:

The problem statement was written successfully.

Aim:

To prepare an Agile Plan.

THEORY

Agile planning is a part of the Agile methodology, which is a project management style with an incremental, iterative approach. Instead of using an in-depth plan from the start of the project—which is typically product-related—Agile leaves room for requirement changes throughout and relies on constant feedback from end users.

With Agile planning, a project is broken down into smaller, more manageable tasks with the ultimate goal of having a defined image of a project's vision. Agile planning involves looking at different aspects of a project's tasks and how they'll be achieved, for example:

- Roadmaps to guide a product's release ad schedule
- Sprints to work on one specific group of tasks at a time
- A feedback plan to allow teams to stay flexible and easily adapt to change

User stories, or the tasks in a project, capture user requirements from the end user's perspective Essentially, with Agile planning, a team would decide on a set of user stories to action at any given time, using them as a guide to implement new features or functionalities in a tool. Looking at tasks as user stories is a helpful way to imagine how a customer may use a feature and helps teams prioritize work and focus on delivering value first.

- Steps in Agile planning process
 1. Define vision
 2. Set clear expectations on goals
 3. Define and break down the product roadmap
 4. Create tasks based on user stories
 5. Populate product backlog
 6. Plan iterations and estimate effort
 7. Conduct daily stand-ups
 8. Monitor and adapt

Result:

Thus the Agile plan was completed successfully.

CREATE USER STORIES**Aim:**

To create User Stories

THEORY

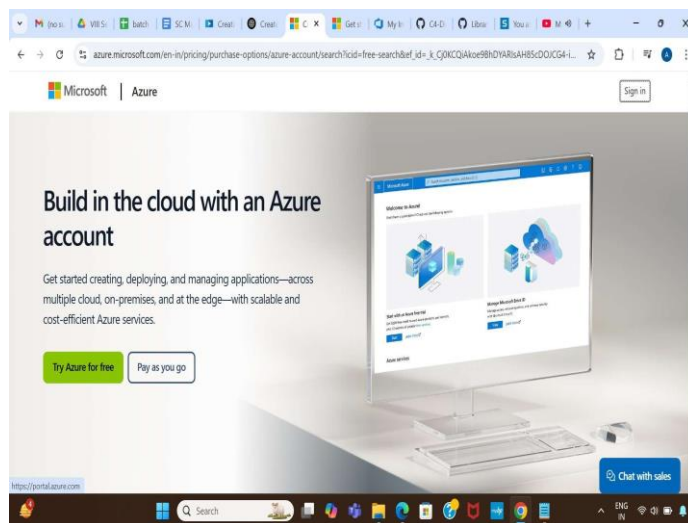
A user story is an informal, general explanation of a software feature written from the perspective of the end user. Its purpose is to articulate how a software feature will provide value to the customer.

User story template

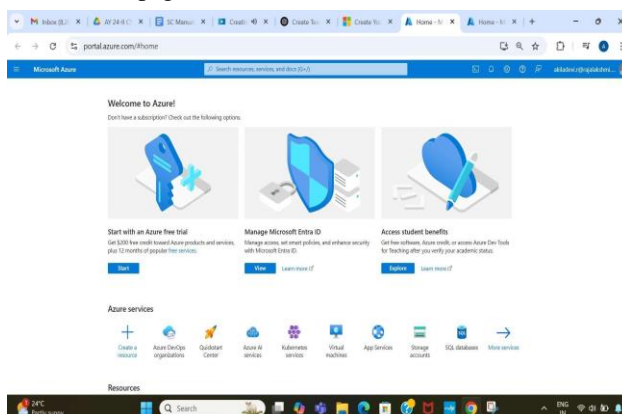
"As a [role], I [want to], [so that]."

Procedure:

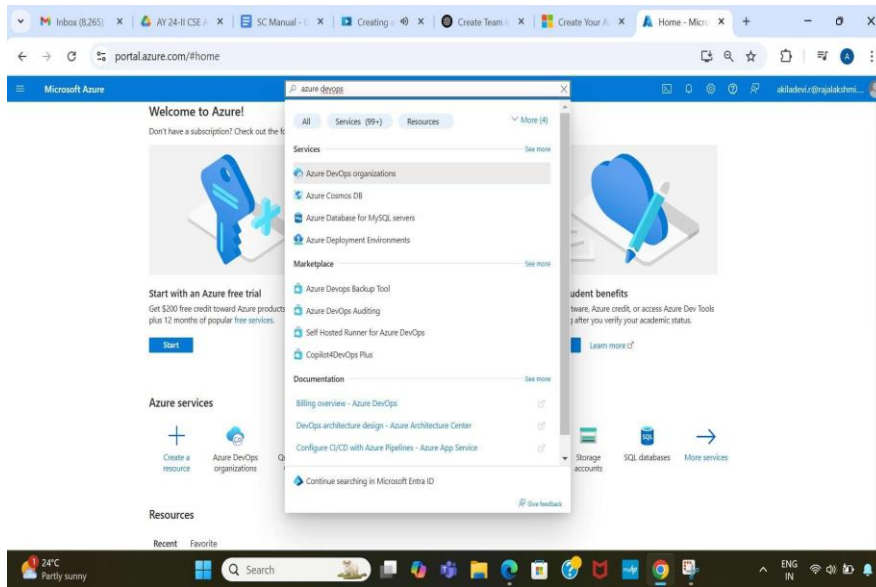
1. Open your web browser and go to the Azure website: <https://azure.microsoft.com/en-in> Sign in using your Microsoft account credentials. If you don't have an account, you'll need to create one.
2. If you don't have a Microsoft account, you can sign up for <https://signup.live.com/?lic=1>



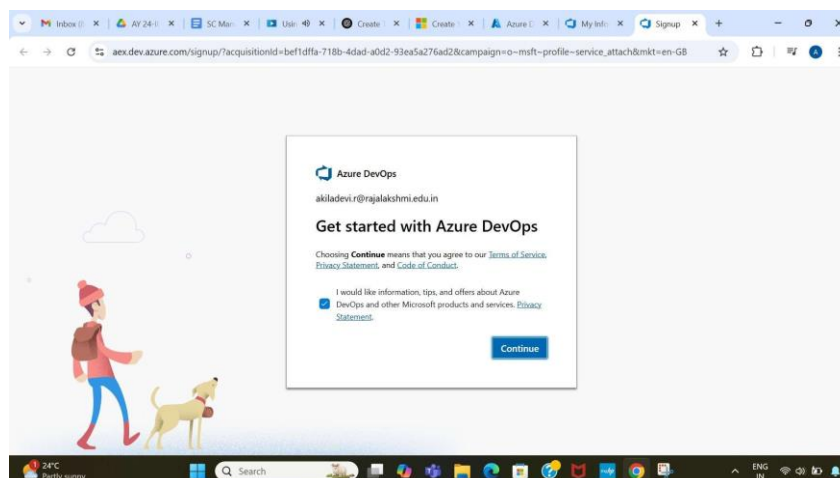
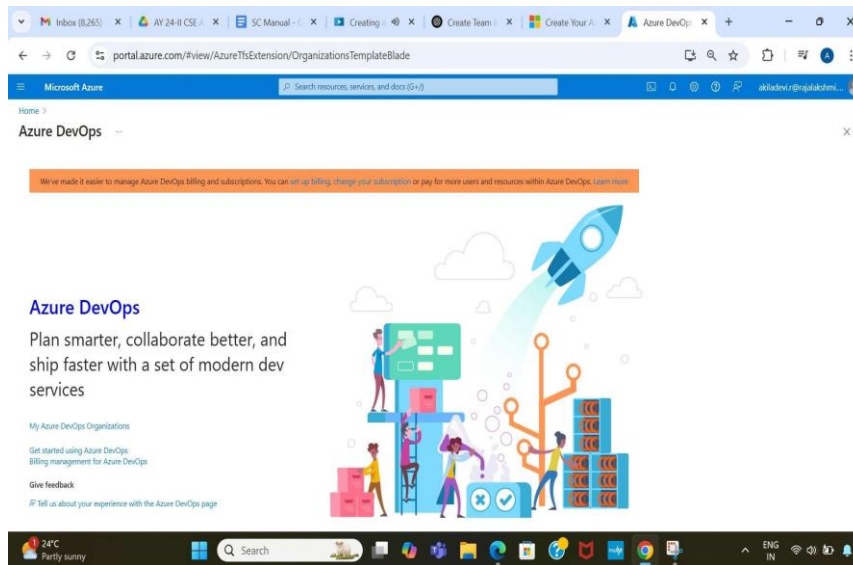
3. Azure home page

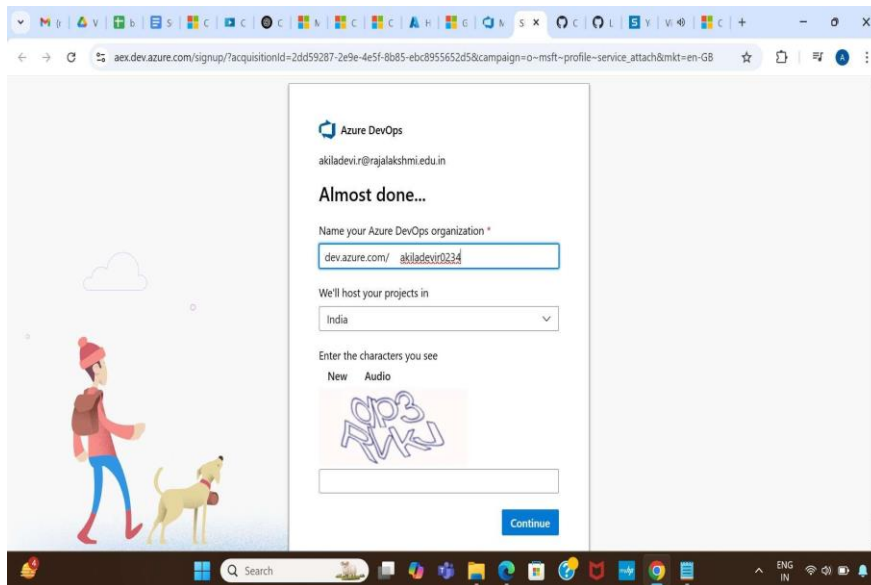


4. Open DevOps environment in the Azure platform by typing Azure DevOps Organizations in the search bar.



5. Click on the My Azure DevOps Organization link and create an organization and you should be taken to the Azure DevOps Organization Home page.



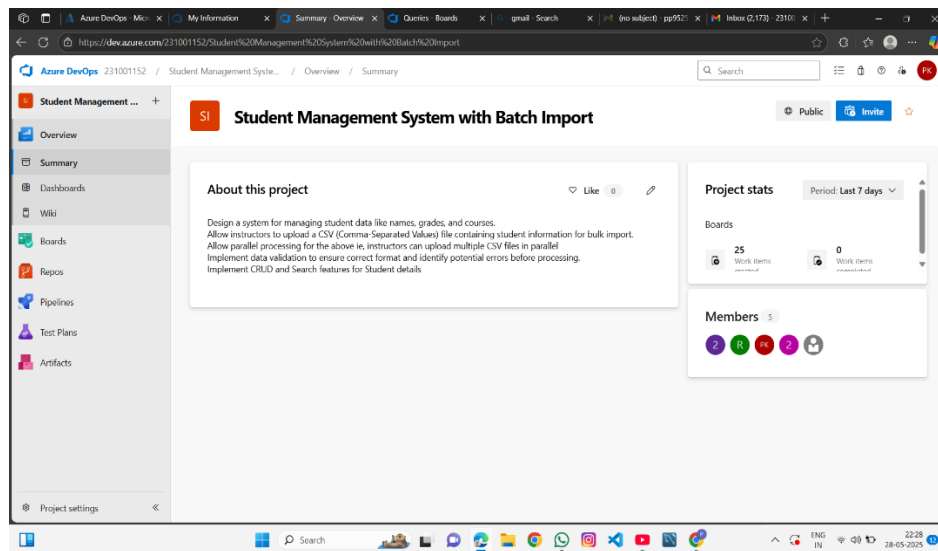
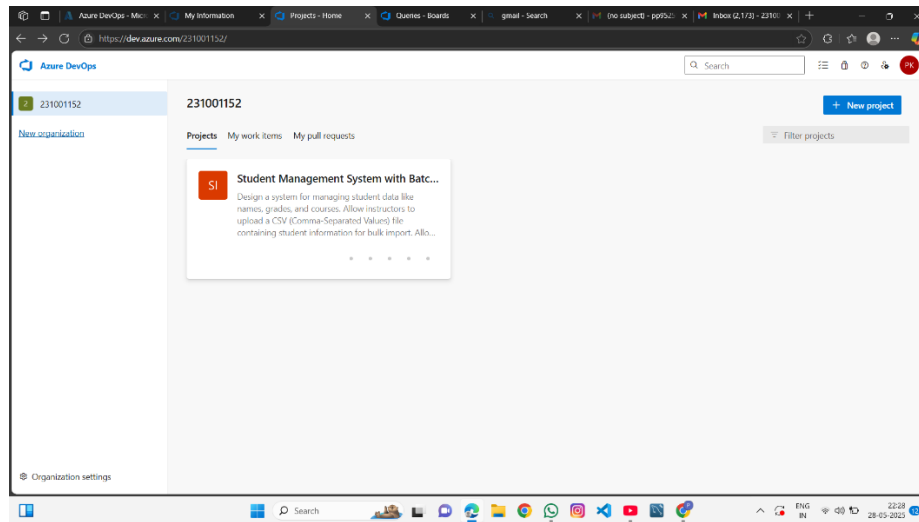


6. Create the First Project in Your Organization

After the organization is set up, you'll need to create your first **project**. This is where you'll begin to manage code, pipelines, work items, and more.

- i. On the organization's **Home page**, click on the **New Project** button.
- ii. Enter the project name, description, and visibility options:
 - o **Name:** Choose a name for the project (e.g., **LMS**).
 - o **Description:** Optionally, add a description to provide more context about the project.
 - o **Visibility:** Choose whether you want the project to be **Private** (accessible only to those invited) or **Public** (accessible to anyone).
- iii. Once you've filled out the details, click **Create** to set up your first project.

7. Once logged in, ensure you are in the correct organization. If you're part of multiple organizations, you can switch between them from the top left corner (next to your user profile). Click on the Organization name, and you should be taken to the Azure DevOps Organization Home page.



8. Project dashboard

9. To manage user

10. stories

- a. From the **left-hand navigation menu**, click on **Boards**. This will take you to the main **Boards** page, where you can manage work items, backlogs, and sprints.
- b. On the **work items** page, you'll see the option to **Add a work item** at the top. Alternatively, you can find a + button or **Add New Work Item** depending on the view you're in. From the **Add a work item** dropdown, select **User Story**. This will open a form to enter details for the new User Story.

The screenshot shows the Azure DevOps Boards interface for the 'Student Management System' project. The left sidebar contains navigation options: Overview, Boards, Work Items, Backlogs, Sprints, Queries, Delivery Plans, Analytics views, Repos, Pipelines, Test Plans, and Artifacts. The main area displays a list of work items under the 'Recently updated' tab. The work items are as follows:

ID	Title	Assigned To	State	Area Path	Tags
1	1. Create Student Record User Story	231001147	New	Student Management System ...	
16	1. Student Record Management (CRUD)	231001147	New	Student Management System ...	
25	10. Auditing & Logging	PRAVEEN KUMAR	New	Student Management System ...	
10	10. Track Import Status	231001146	New	Student Management System ...	
11	11. Preview Data Before Import	231001146	New	Student Management System ...	
12	12. Receive Success/Error Report After Import	231001146	New	Student Management System ...	
13	13. Restrict Duplicate Entries	PRAVEEN KUMAR	New	Student Management System ...	
14	14. Set Constraints on Grade and Course Fields	PRAVEEN KUMAR	New	Student Management System ...	
15	15. Log Import Activities for Auditing	PRAVEEN KUMAR	New	Student Management System ...	
17	2. Search Functionality	231001147	New	Student Management System ...	
2	2. View Student Details User Story	231001147	New	Student Management System ...	

11. Fill in User Story Details

The screenshot shows the details of User Story 11: 'Preview Data Before Import'. The work item is assigned to 231001146 and is in the 'New' state. The description is: 'As an instructor, I want to preview the parsed CSV data before final submission so that I can verify it's correct.' The acceptance criteria are:

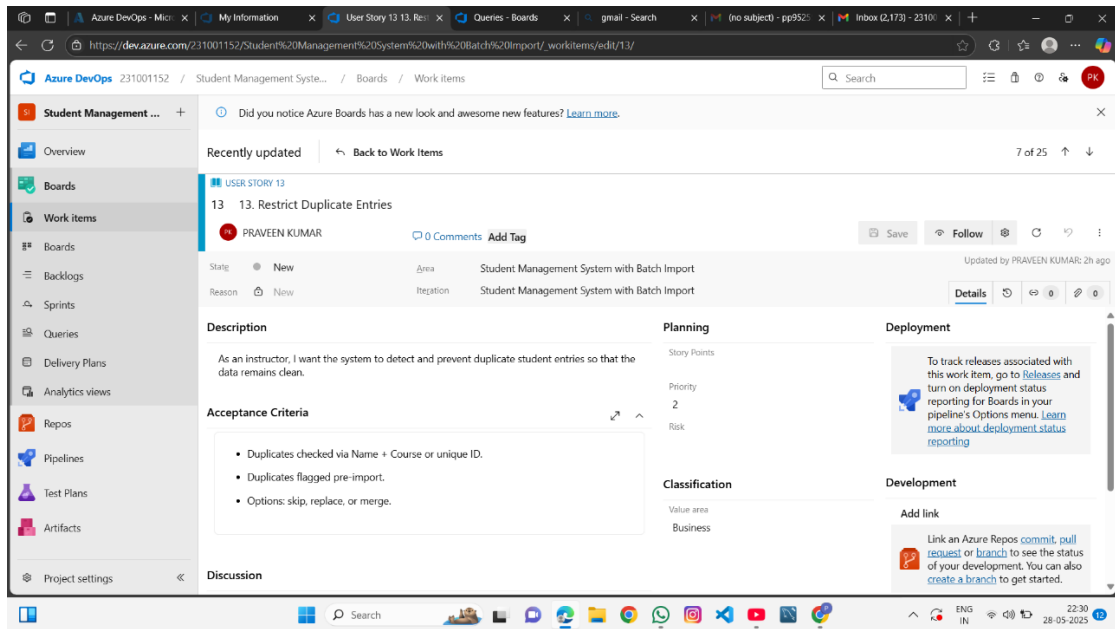
- Preview table shown after upload.
- All records viewable with scroll.
- Errors highlighted.
- Confirm or Cancel import options.

The planning section shows 2 story points, priority 2, and risk. The classification is 'Business'. The deployment section includes a link to 'To track releases associated with this work item, go to Releases and turn on deployment status reporting for Boards in your pipeline's Options menu. Learn more about deployment status reporting.' The development section includes a link to 'Link an Azure Repos commit, pull request or branch to see the status of your development. You can also create a branch to get started.'

The screenshot shows the details of User Story 6: 'Upload Student CSV File'. The work item is assigned to 231001170@rajalakshmi.edu.in and is in the 'New' state. The description is: 'As an instructor, I want to upload a CSV file containing student data so that I can import multiple students at once.' The acceptance criteria are:

- Upload button with file chooser.
- Only .csv files are accepted.
- File uploads trigger preview or import step.

The planning section shows 2 story points, priority 2, and risk. The classification is 'Business'. The deployment section includes a link to 'To track releases associated with this work item, go to Releases and turn on deployment status reporting for Boards in your pipeline's Options menu. Learn more about deployment status reporting.' The development section includes a link to 'Link an Azure Repos commit, pull request or branch to see the status of your development. You can also create a branch to get started.'



Result:

The user story was written successfully.

EX NO: 5

SEQUENCE DIAGRAM

Aim:

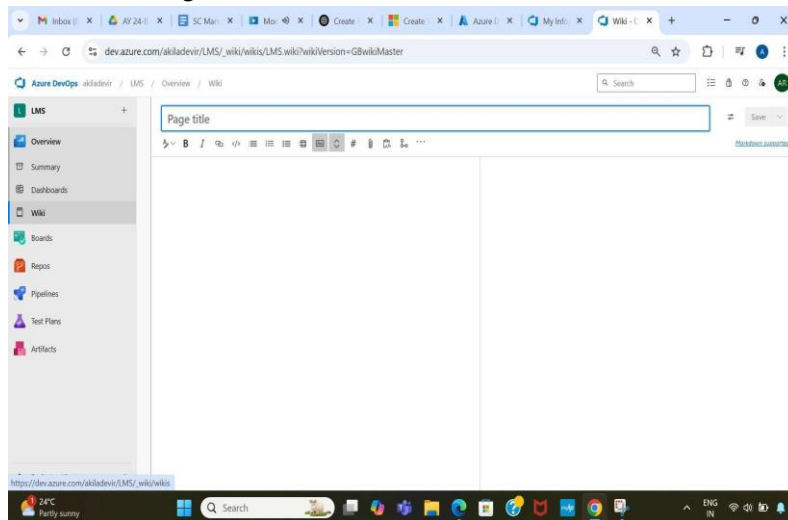
To design a Sequence Diagram by using Mermaid.js

THEORY:

A Sequence Diagram is a key component of Unified Modelling Language (UML) used to visualize the interaction between objects in a sequential order. It focuses on how objects communicate with each other over time, making it an essential tool for modelling dynamic behaviour in a system.

Procedure:

1. Open a project in Azure DevOps Organisations.
2. To design select wiki from menu



3. Write code for drawing sequence diagram and save the code.

```
sequenceDiagram
    participant Student
    participant Parent
    participant Teacher
    participant Admin
    participant Dashboard
    participant AlertSys
    participant RptGen
```

```
Student->>Dashboard: viewDashboard()
Dashboard-->>Student: displayPerformance()
```

```
Parent->>Dashboard: viewChildDashboard(studentID)
Dashboard-->>Parent: displayPerformance(studentID)
```

Teacher->>RptGen: generateReport(studentID)
RptGen-->>Teacher: Report Generated

Admin->>RptGen: generateClassReport(classID)
RptGen-->>Admin: Class Report Generated

Teacher->>Dashboard: updates
Dashboard-->>Teacher: Updated Dashboard

Teacher->>AlertSys: triggers alert(studentID, message)
AlertSys-->>Student: notifies(studentID, message)

Student->>AlertSys: receives alert()::

Explanation:

participant defines the entities involved.

->> represents a direct message.

-->> represents a response message.

+ after ->> activates a participant.

- after -->> deactivates a participant.

alt / else for conditional flows.

loop can be used for repeated actions.

-> Solid line without arrow

--> Dotted line without arrow

->> Solid line with arrowhead

-->> Dotted line with arrowhead

<<->> Solid line with bidirectional arrowheads (v11.0.0+)

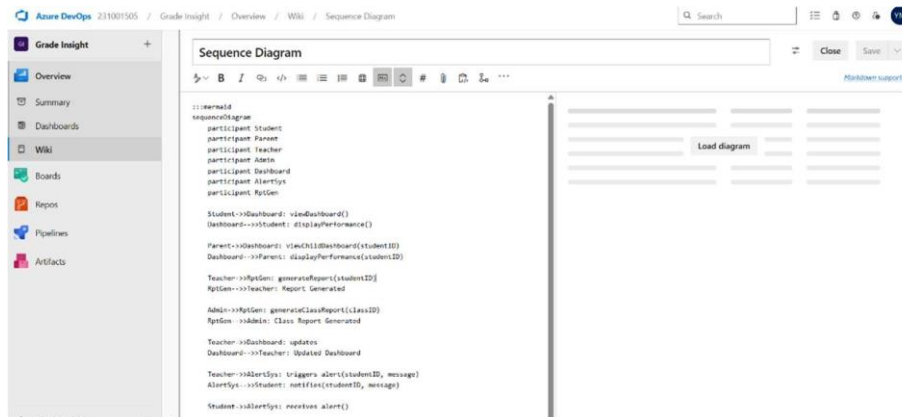
<<->> Dotted line with bidirectional arrowheads (v11.0.0+)

-x Solid line with a cross at the end

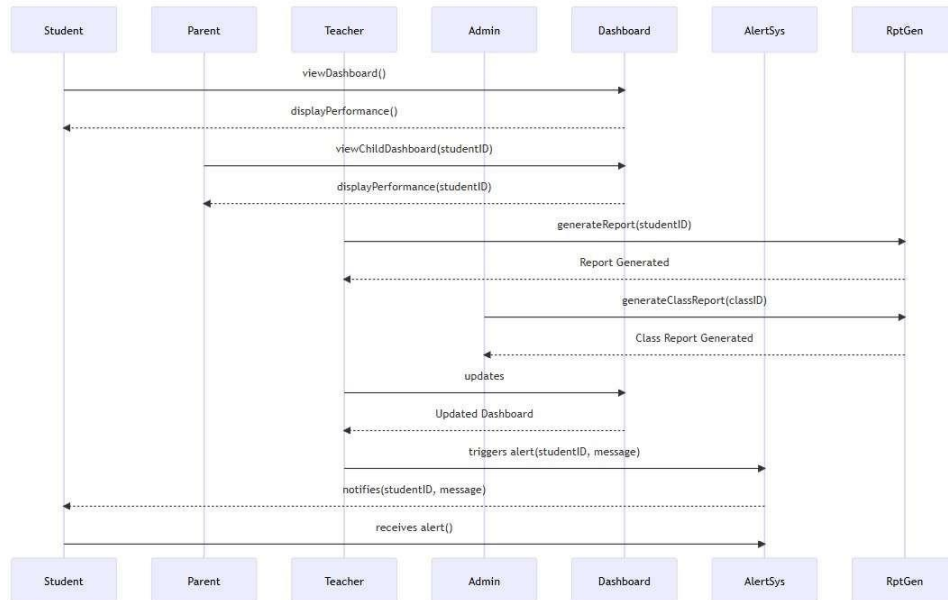
--x Dotted line with a cross at the end

-) Solid line with an open arrow at the end (async)

--) Dotted line with an open arrow at the end (async)



4. click wiki menu and select the page



Result:

The sequence diagram was drawn successfully.

EX NO. 6

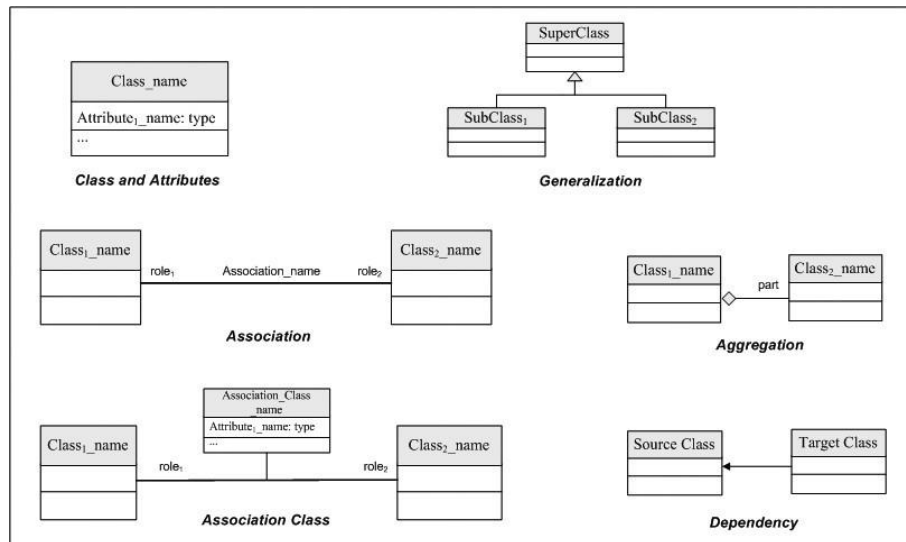
CLASS DIAGRAM

AIM :-

To draw a sample class diagram for your project or system.

THEORY

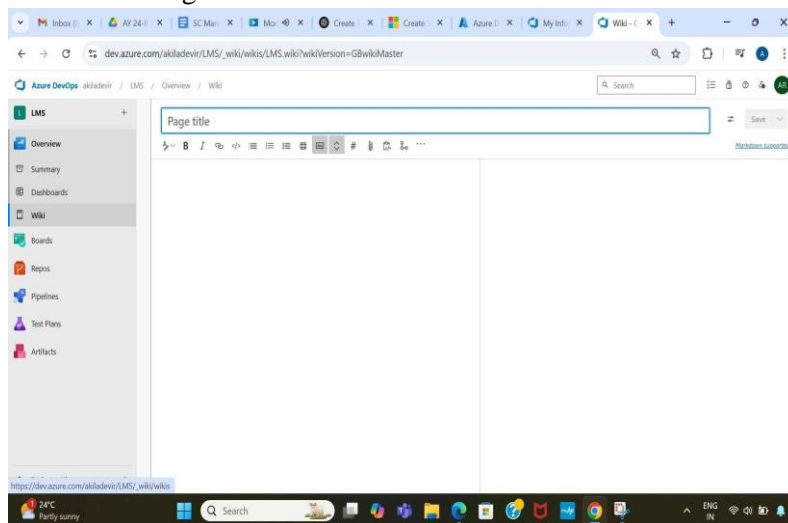
A UML class diagram is a visual tool that represents the structure of a system by showing its classes, attributes, methods, and the relationships between them.



Notations in class diagram

Procedure:

1. Open a project in Azure DevOps Organisations.
2. To design select wiki from menu



3. Write code for drawing class diagram and save the code

:::mermaid

classDiagram

```
class Student {
    +String name
    +int studentID
    +Dictionary grades
    +void viewDashboard()
    +void receiveAlert(String message)
}

class Parent {
    +String name
    +int parentID
    +void viewChildDashboard(int studentID)
}

class Teacher {
    +String name
    +int teacherID
    +void inputGrades(int studentID, Dictionary grades)
    +void generateFeedback(int studentID)
}

class Admin {
    +String name
    +int adminID
    +void standardizeGradingCriteria()
    +void exportPerformanceReports()
}

class Dashboard {
    +void displayPerformance(int studentID)
    +void displayAlerts(int studentID)
}
```

```

class AlertSys {

    +void generateAlert(int studentID, String message)

}

```

```

class RptGen {

    +void generateReport(int studentID)

    +void generateClassReport(int classID)

}

```

Student --> Dashboard : views

Parent --> Dashboard : views

Teacher --> RptGen : uses

Admin --> RptGen : uses

AlertSys --> Student : notifies

Teacher --> AlertSys : triggers

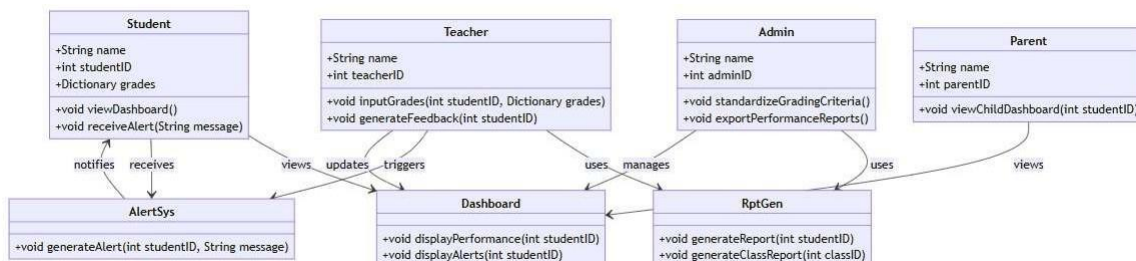
Student --> AlertSys : receives

Teacher --> Dashboard : updates

Admin --> Dashboard : manages

Relationship Types

Type	Description
<	Inheritance
*	Composition
o	Aggregation
>	Association
<	Association
>	Realization



Result:

The use case diagram was designed successfully.

USECASE DIAGRAM

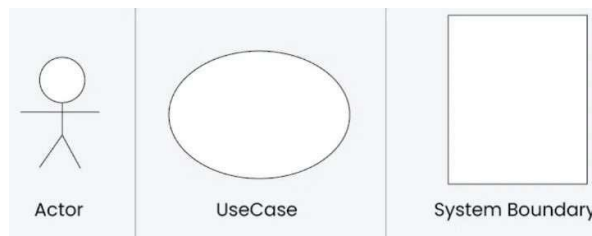
Aim:

Steps to draw the Use Case Diagram using draw.io

Theory:

• UCD shows the relationships among actors and use cases within a system which Provide an overview of all or part of the usage requirements for a system or organization in the form of an essential model or a business model and communicate the scope of a development project

- Use Cases
- Actors
- Relationships
- System Boundary Boxes



Procedure

Step 1: Create the Use Case Diagram in Draw.io

- Open Draw.io (diagrams.net).
- Click "Create New Diagram" and select "Blank" or "UML Use Case" template.
- Add Actors (Users, Admins, External Systems) from the UML section.
- Add Use Cases (Functionalities) using ellipses.
- Connect Actors to Use Cases with lines (solid for direct interaction, dashed for <<include>> and <<extend>>).
- Save the diagram as .drawio or export as PNG/JPG/SVG.

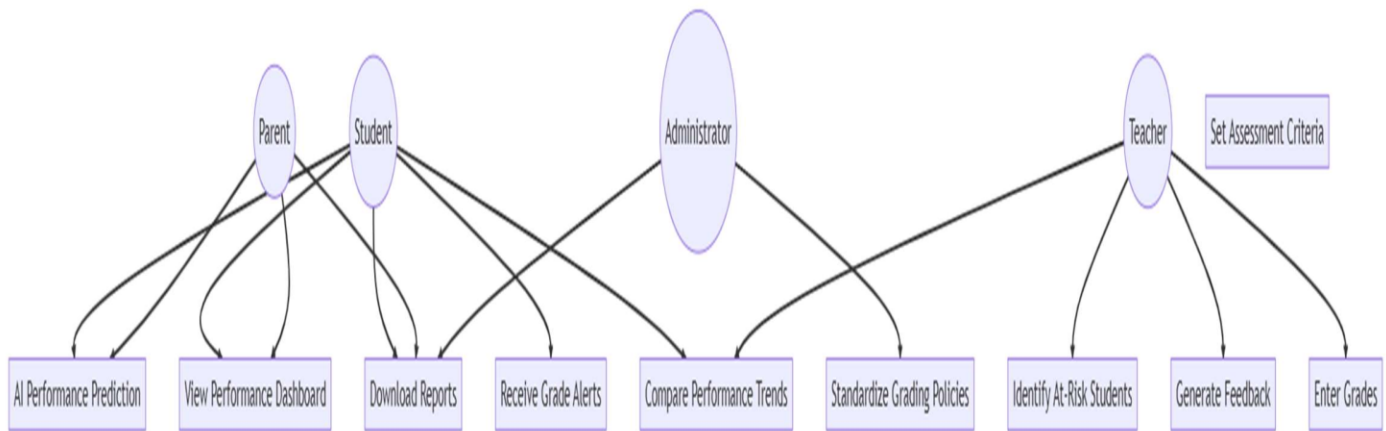
Step 2: Upload the Diagram to Azure DevOps

Option 1: Add to Azure DevOps Wiki

- Open Azure DevOps and go to your project.
- Navigate to Wiki (Project > Wiki).
- Click "Edit Page" or create a new page.
- Drag & Drop the exported PNG/JPG image.
- Use Markdown to embed the diagram:
- ![Use Case Diagram](attachments/use_case_diagram.png)

Option 2: Attach to Work Items in Azure Boards

- Open Azure DevOps → Navigate to Boards (Project > Boards).
 - Select a User Story, Task, or Feature.
 - Click "Attachments" → Upload your Use Case Diagram.
 - Add comments or descriptions to explain the use case.
-



Result:

The use case diagram was designed successfully

EX NO. 8



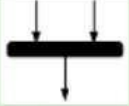



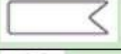




ACTIVITY DIAGRAM

AIM :-

To draw a sample activity diagram for your project or system.

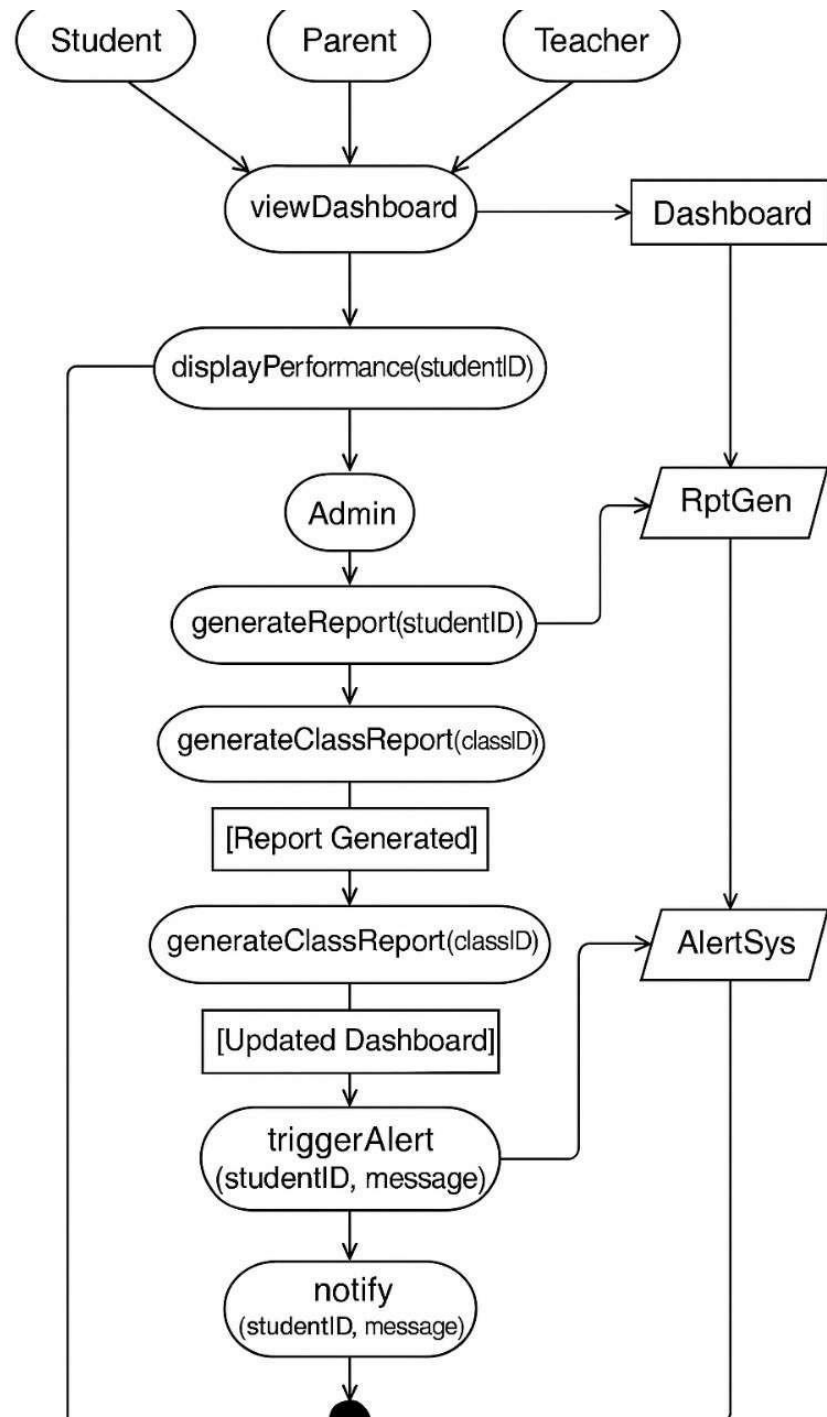
THEORY

Activity diagrams are an essential part of the Unified Modelling Language (UML) that help visualize workflows, processes, or activities within a system. They depict how different actions are connected and how a system moves from one state to another.

Notations	Symbol	Meaning
Start		Shows the beginning of a process
Connector		Shows the directional flow, or control flow, of the activity
Joint symbol		Combines two concurrent activities and re-introduces them to a flow where one activity occurs at a time
Decision		Represents a decision
Note		Allows the diagram creators to communicate additional messages
Send signal		Show that a signal is being sent to a receiving activity
Receive signal		Demonstrates the acceptance of an event
Flow final symbol		Represents the end of a specific process flow
Option loop		Allows the creator to model a repetitive sequence within the option loop symbol
Shallow history pseudostate		Represents a transition that invokes the last active state.
End		Marks the end state of an activity and represents the completion of all flows of a process

Procedure

1. Draw diagram in draw.io
2. Upload the diagram in Azure DevOps wiki



Result:
The activity diagram was designed successfully

EX NO. 9

ARCHITECTURE DIAGRAM

Aim:

Steps to draw the Architecture Diagram using draw.io.

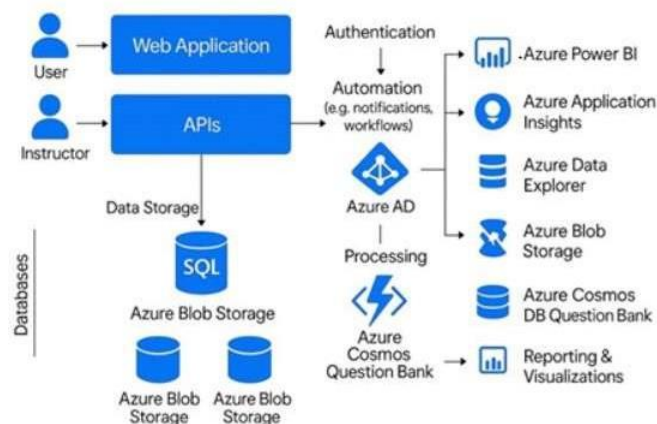
Theory:

An architectural diagram is a visual representation that maps out the physical implementation for components of a software system. It shows the general structure of the software system and the associations, limitations, and boundaries between each element.



Procedure

1. Draw diagram in draw.io
2. Upload the diagram in Azure DevOps wiki



Result:

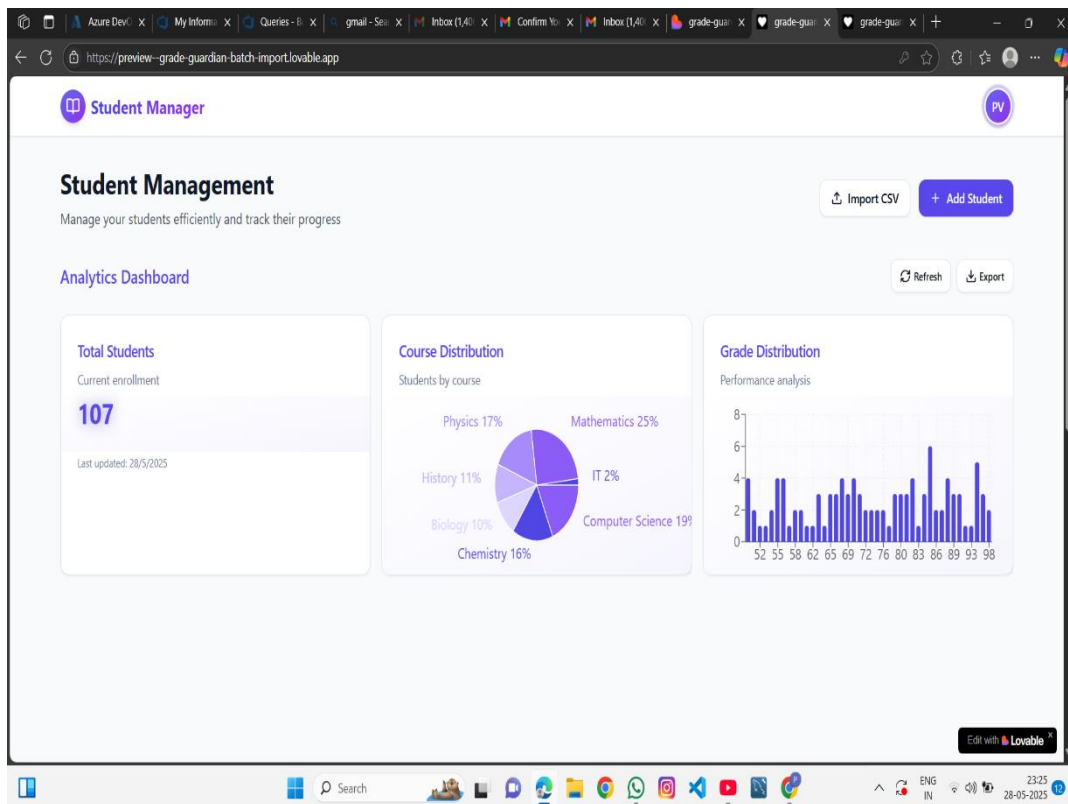
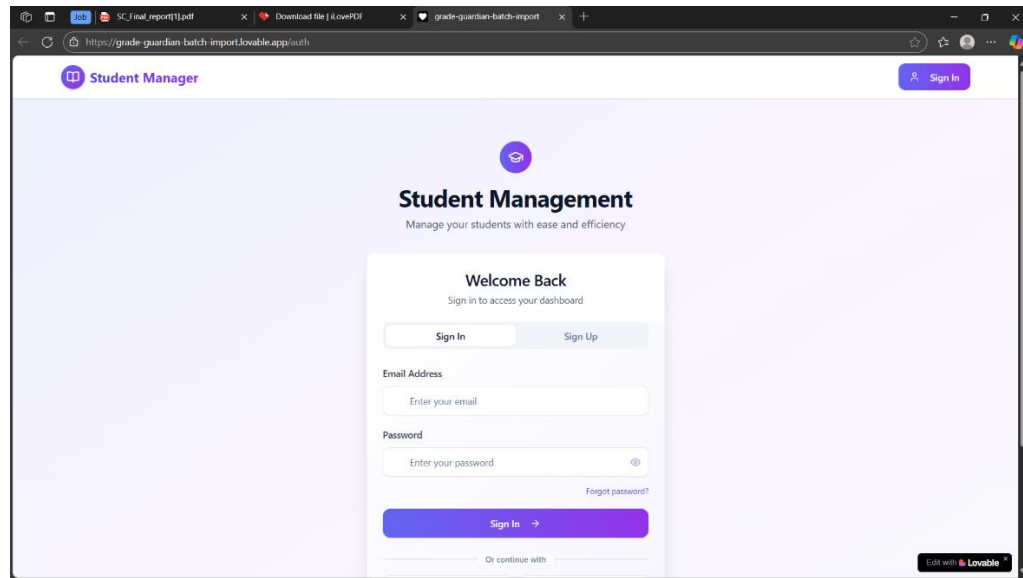
The architecture diagram was designed successfully

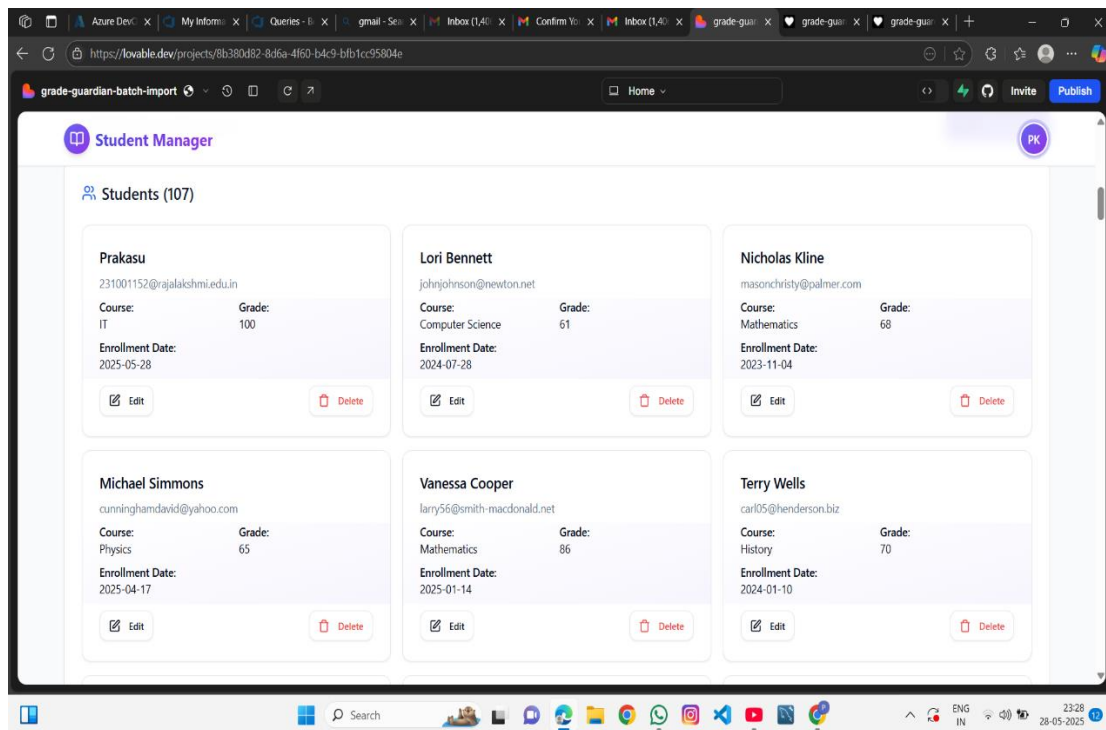
EX NO. 10

USER INTERFACE

Aim:

Design User Interface for the given project





Result:
The UI was designed successfully.

Aim:

To implement the given project based on Agile Methodology.

Procedure:**Step 1: Set Up an Azure DevOps Project**

- Log in to Azure DevOps.
- Click "New Project" → Enter project name → Click "Create".
- Inside the project, navigate to "Repos" to store the code.

Step 2: Add Your Web Application Code

- Navigate to Repos → Click "Clone" to get the Git URL.
- Open Visual Studio Code / Terminal and run:

```
git clone <repo_url>
cd <repo_folder>
```
- Add web application code (HTML, CSS, JavaScript, React, Angular, or backend like Node.js, .NET, Python, etc.).
- Commit & push:

```
git add .
git commit -m "Initial commit"
git push origin main
```

Step 3: Set Up Build Pipeline (CI/CD - Continuous Integration)

- Navigate to Pipelines → Click "New Pipeline".
- Select Git Repository (Azure Repos, GitHub, or Bitbucket).
- Choose Starter Pipeline or a pre-configured template for your framework.
- Modify the azure-pipelines.yml file (Example for a Node.js app):

```
trigger:
- main

pool:
  vmImage: 'ubuntu-latest'

steps:
- task: UseNode@1
  inputs:
    version: '16.x'

- script: npm install
  displayName: 'Install dependencies'

- script: npm run build
  displayName: 'Build application'

- task: PublishBuildArtifacts@1
  inputs:
    pathToPublish: 'dist'
    artifactName: 'drop'
```

Click "Save and Run" → The pipeline will start building app.

Step 4: Set Up Release Pipeline (CD - Continuous Deployment)

- Go to Releases → Click "New Release Pipeline".
- Select Azure App Service or Virtual Machines (VMs) for deployment.
- Add an artifact (from the build pipeline).
- Configure deployment stages (Dev, QA, Production).
- Click "Deploy" to push your web app to Azure.

Result

Thus the application was successfully implemented.