PROJECT REPORT

for

CS-3009: Software Engineering

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FAST NUCES

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Group Members

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INTRODUCTION

The project is a comprehensive software platform designed to facilitate interaction and management for students, societies, and administrators within a university by automating all tasks related to society activities. The details of interactions have been specifically designed keeping in mind the society ecosystem within FAST NUCES, Islamabad campus. Built using Scrum methodology with iterative sprints, the system emphasizes secure authentication, real-time content management, and role-based access control. Key features include user login/signup, post and comment creation/editing/deletion, file attachments, profile customization, society membership management, event scheduling, and administrative tools for moderation and approvals. The frontend leverages React for a responsive UI, while the backend utilizes RESTful APIs and MongoDB for data storage. Security measures such as role-based access and input validation ensure compliance with user stories and functional requirements. The project's modular design supports scalability, enabling seamless integration of future enhancements like advanced analytics or mobile compatibility, with a JavaFX version already developed as a prototype for possible future deployment as a desktop app.

PROJECT RATIONALE

This platform addresses the need for a centralized, secure, and interactive space where students and societies can collaborate, share resources, and manage events, as these tasks usually involve hefty time delays and physical exertion among all parties involved. User stories highlight the following main critical requirements:

- Students require tools to engage in discussions (comments/posts), manage their membership in societies, and update personal profiles.
- Societies need mechanisms to schedule announcements, get their events approved with venue bookings, manage roles assigned to their members/teams.
- Admins must moderate content, approve/reject applications for bookings, and ensure platform security.

By implementing features like real-time updates, role-based permissions, and input validation, the system mitigates inefficiencies in manual processes (e.g., paper-based applications or disjointed communication). The Scrum approach ensures iterative delivery of high-priority features, while burndown charts and sprint reviews track progress. The project aligns with modern software practices, emphasizing usability, security, and scalability to meet evolving academic community needs.

PROJECT ARCHITECTURE

The system follows a three-tier architecture:

Frontend: Built with React, providing a dynamic and responsive interface. Components include login/signup forms, post/comment modules, event/venue pages and admin dashboards. UI libraries ensure consistency, while animations enhance user experience.

Backend: Node.js/Express.js handles RESTful APIs for authentication, CRUD operations (posts, comments), and society management. Key integrations MongoDB for storing user data, posts, comments, and society records.

Database: MongoDB database for collection and storage of data, changes in it can be made by all 3 actors.

The architecture ensures modularity, enabling independent scaling of components. Sprint artifacts like sprint backlogs and Gantt charts coordinate task assignments, while burndown charts monitor sprint progress, ensuring timely delivery of features aligned with user stories.

PRODUCT BACKLOG

ID	USER STORY	ESTIMATE HOURS	PRIORITY NUMBER	ACCEPTANCE CRITERIA
1	As a user, I want to securely log in or sign up with email/password, so that I can access the platform with role-based permissions.	10	1	Given a user is on the login page with valid credentials, when they submit, then they are authenticated and redirected to their role-based dashboard. Given a user enters invalid credentials, when they attempt to log in, then an error is shown and access is denied.

2	As a student, I want to comment on a post so that I can express my opinion.	10	2	Given a student is viewing a post, when they submit a comment, then it appears under the post. Given a student submits an empty comment, when they click "Submit", then a validation error appears.
3	As a society, I want to moderate comments on my posts so that I can ensure only appropriate content is displayed.	8	3	Given a society views a comment on their post, when they delete it, then the comment is removed. Given a society tries to moderate another society's post, when they delete a comment, then permission is denied.
4	As a student, I want to delete my comment so that I can remove outdated or unnecessary remarks.	7	4	Given a student views their comment, when they delete it, then the comment is removed. Given a student tries to delete another user's comment, when they click "Delete", then permission is denied.
5	As a student, I want to check my application status so that I know if I've been accepted.	7	5	Given a student has applied to a society, when they check their status, then it shows "Pending". Given a student has no applications, when they check their status, then "No applications" is displayed.
6	As a student, I want to cancel my application so	8.5	6	Given a student has a pending application, when

	that I can apply elsewhere or change my mind.			they cancel it, then it is withdrawn. Given a student's application is approved, when they try to cancel, then an error prevents it.
7	As a society, I want to review and approve/reject membership applications so that I control who joins.	13.5	7	Given a society reviews an application, when they approve it, then the applicant is notified. Given a society rejects an application, when they submit, then the applicant is notified.
8	As a student, I want to receive a confirmation prompt before leaving a society so that I don't leave by mistake.	10	8	Given a student clicks "Leave Society", when they confirm, then they are removed. Given a student cancels leaving, when they click "No", then their membership remains.
9	As a society, I want to track the history of members who left so that I can maintain records.	5	9	Given a member leaves a society, when the society checks history, then their exit date is recorded.
10	As a student/society, I want to edit a post after publishing so that I can fix mistakes or update information.	7	10	Given a student/society edits their post, when they save changes, then the post updates. Given a user tries to edit another's post, when they click "Edit", then permission is denied.

11	As a student/society, I want to delete a post so that I can remove irrelevant or outdated content.	4	11	Given a student/society deletes their post, when confirmed, then the post is removed.
12	As an admin, I want to remove inappropriate posts so that the platform remains professional.	10	12	Given an admin flags a post as inappropriate, when they delete it, then the author is notified.
13	As a student/society, I want to attach images and files to my posts so that I can provide better context.	4.5	13	Given a user attaches a file to a post, when they publish, then it displays the attachment. Given a user uploads an invalid file type, when they submit, then an error is shown.
14	As a student/society, I want to update my profile picture so that I can personalize my profile.	3	14	Given a user uploads a new profile picture, when they save, then the image updates.
15	As a student/society, I want to update my bio so that I can share more about myself.	3	15	Given a user edits their bio, when they save, then the new bio is visible.
16	As a student/society, I want to change my password so that I can keep my account secure.	3.5	16	Given a user enters a correct current password, when they set a new one, then it updates. Given a user enters a wrong password, when they try to change it, then an error occurs.
17	As a society, I want to schedule announcements so that I can automate communication.	5	17	Given a society schedules an announcement, when the time arrives, then it posts automatically.

18	As a society, I want to assign leadership roles so that responsibilities are clear.	6	18	Given a society assigns a role to a member, when saved, then the role reflects in their profile.
19	As a student, I want to see my assigned role in a society so that I understand my responsibilities.	-	19	Given a student views their society profile, when they check roles, then their role is shown.
20	As a society, I want to modify my venue booking so that I can change the date or location if needed.	-	20	Given a society edits a booking, when they submit changes, then the admin is notified.
21	As a society, I want to cancel a venue booking so that I can free up space for others if I no longer need it.	-	21	Given a society cancels a booking, when confirmed, then the slot is freed.
22	As a student, I want to receive event reminders so that I don't miss important activities.	-	22	Given a student RSVPs to an event, when it nears, then they receive a reminder.
23	As an admin, I want to approve venue booking requests so that I can manage availability.	-	23	Given an admin approves a booking, when confirmed, then the venue is reserved.
24	As a student, I want to view a list of all societies so that I can decide which ones to join.	-	24	Given a student views the societies list, when loaded, then all societies are displayed.

PROJECT PLANNERS

Sprint 1

Date	Backlog Item	Task	Assignee
March 13	User Story 1	Login/Signup	Hamza
March 14	User Story 2	Comment on a post	Murtaza
March 15	User Story 3	Moderate comments	Murtaza
March 16	User Story 4	Delete comment	Hamza
March 17	User Story 5	Check application status	Hamza
March 18	User Story 6	Cancel application	Murtaza
March 19	User Story 7	Manage applications	Hamza
March 20	User Story 8	Leaving confirmation	Ataa
March 21	User Story 9	Member history tracking	Ataa

Sprint 2

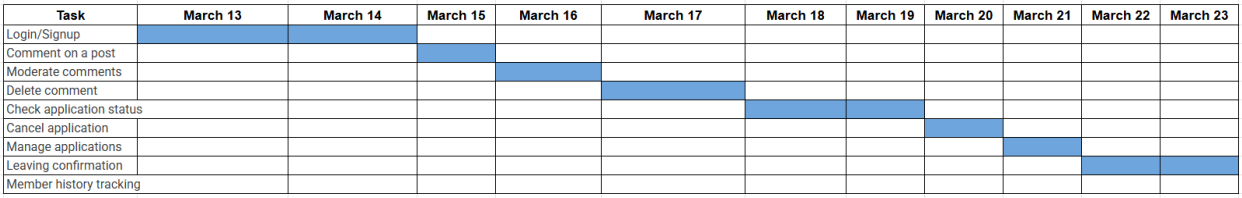
Date	Backlog Item	Task	Assignee
April 16	User Story 10	Edit post	Ataa
April 17	User Story 11	Delete post	Murtaza
April 18	User Story 12	Remove post	Murtaza
April 19	User Story 13	Attach file to post	Murtaza
April 20	User Story 14	Update profile picture	Hamza
April 21	User Story 15	Update bio	Hamza
April 22	User Story 16	Change password	Hamza
April 23	User Story 17	Schedule announcement	Ataa
April 24	User Story 18	Assign roles	Ataa

Sprint 3

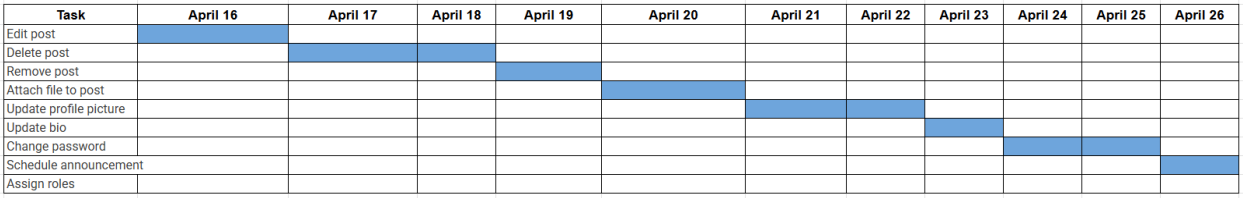
Date	Backlog Item	Task	Assignee
May 1	User Story 20, 21, 23	Venue bookings	Hamza
May 2	User Story 19	View role in society	Murtaza
May 3	User Story 22	Receive reminders	Murtaza
May 4	User Story 24	View list of societies	Hamza

GANTT CHARTS

Sprint 1



Sprint 2



Sprint 3

Task	May 1	May 2	May 3	May 4
View role in society				
Modify venue booking				
Cancel venue booking				
Receive reminders				
Approve venue booking				
View list of societies				

BURNDOWN CHARTS

Sprint 1

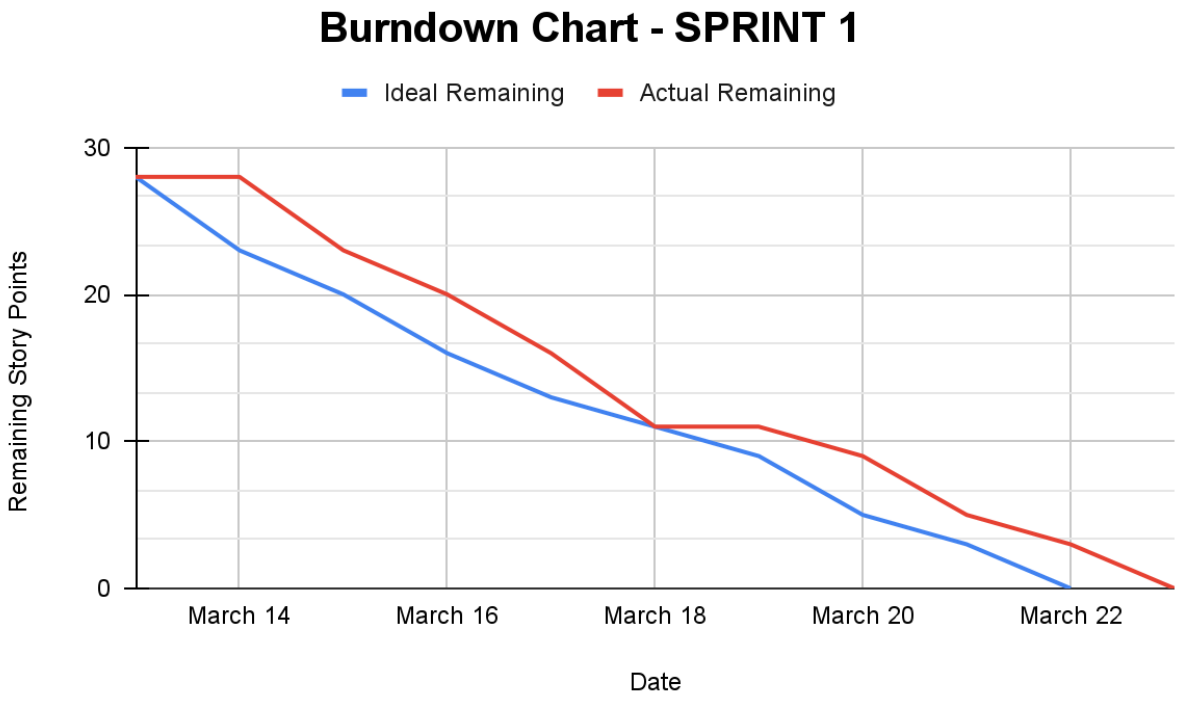
Tasks and Estimates

Sprint Task	Story Points
Login/Signup	5
Comment on a post	3
Moderate comments	4
Delete comment	3
Check application status	2
Cancel application	2
Manage applications	4
Leaving confirmation	2
Member history tracking	3
Total	**28**

Remaining Work Over Time

Date	Ideal Remaining	Actual Remaining
March 13	28	28
March 14	23	28
March 15	20	23
March 16	16	20
March 17	13	16
March 18	11	11
March 19	9	11
March 20	5	9

March 21	3	5
March 22	0	3
March 23	-	0



Sprint 2

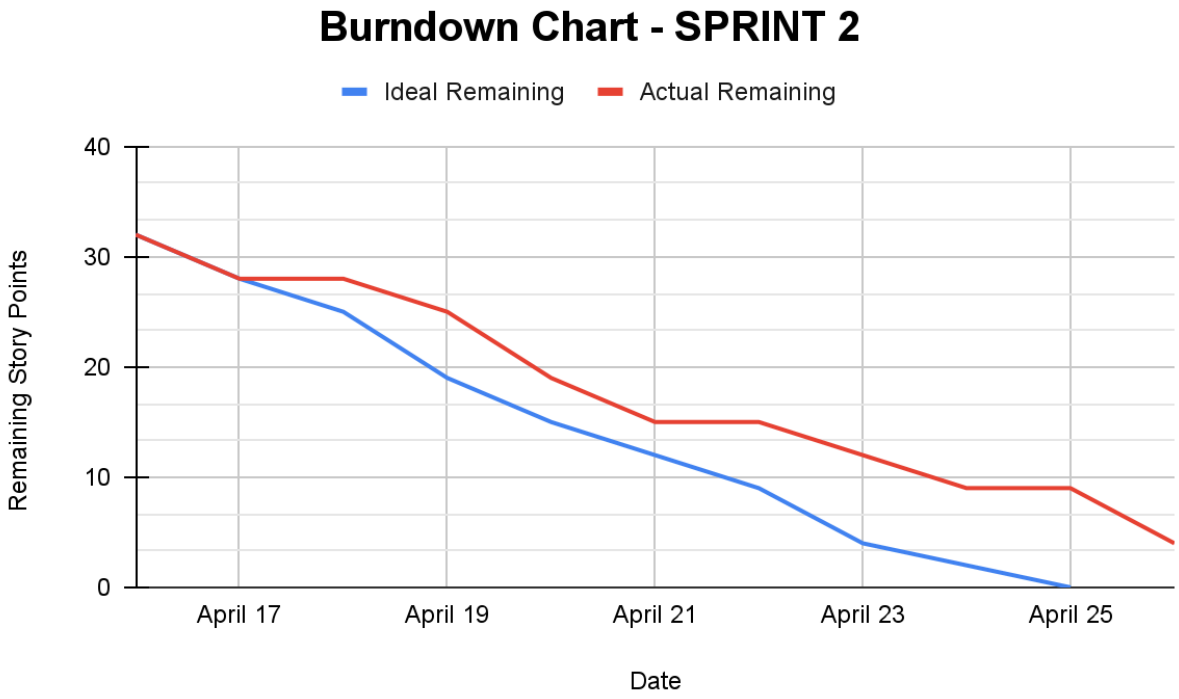
Tasks and Estimates

Sprint Task	Story Points
Edit post	4
Delete post	3
Remove post	6
Attach file to post	4
Update profile picture	3
Update bio	3

Change password	5
Schedule announcement	2
Assign roles	2
Total	**32**

Remaining Work Over Time

Date	Ideal Remaining	Actual Remaining
April 16	32	32
April 17	28	28
April 18	25	28
April 19	19	25
April 20	15	19
April 21	12	15
April 22	9	15
April 23	4	12
April 24	2	9
April 25	0	9
April 26	-	4



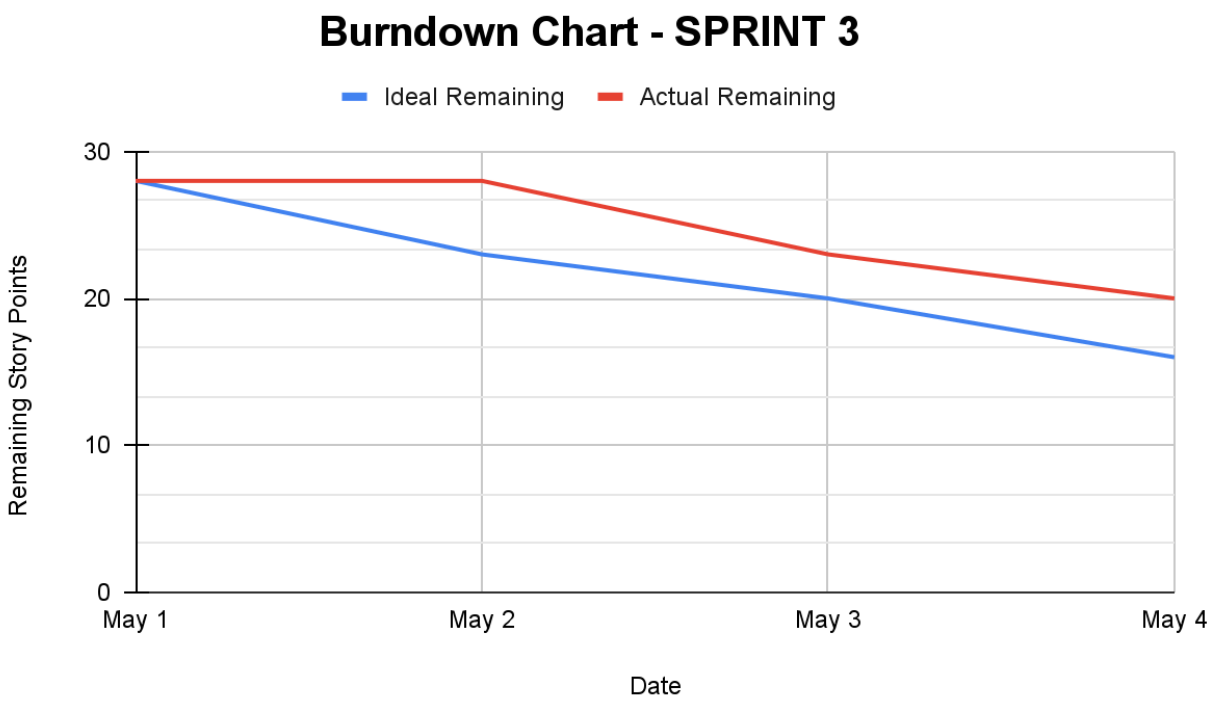
Sprint 3

Tasks and Estimates

Sprint Task	Story Points
View role in society	5
Modify venue booking	3
Cancel venue booking	2
Receive reminders	4
Approve venue booking	4
View list of societies	2
Total	**20**

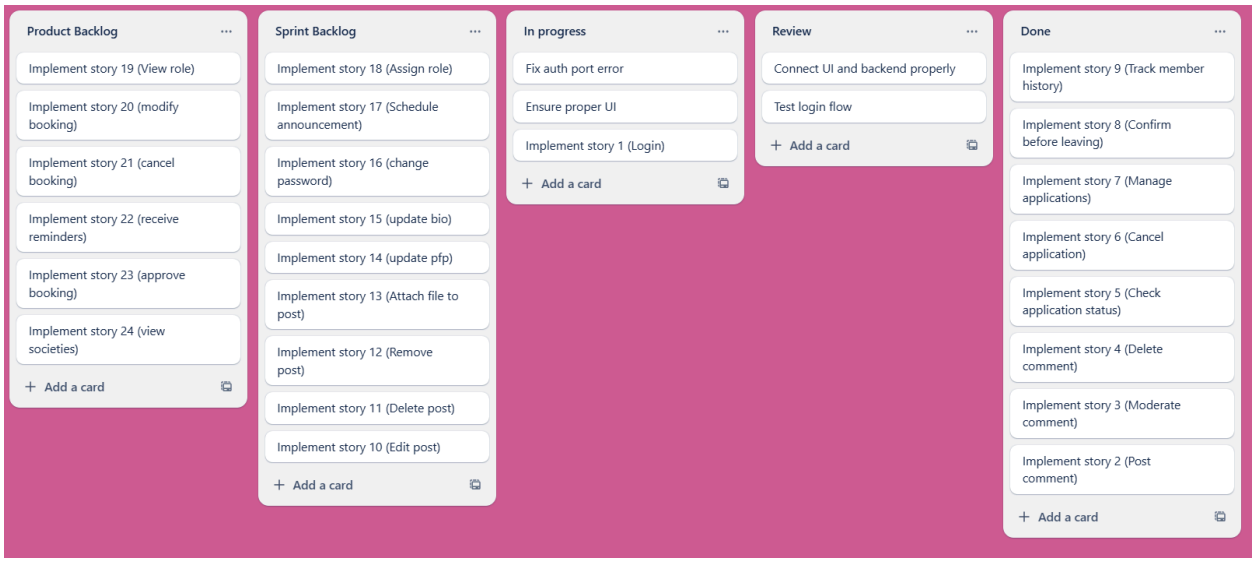
Remaining Work Over Time

Date	Ideal Remaining	Actual Remaining
May 1	20	20
May 2	12	20
May 3	6	12
May 4	0	0

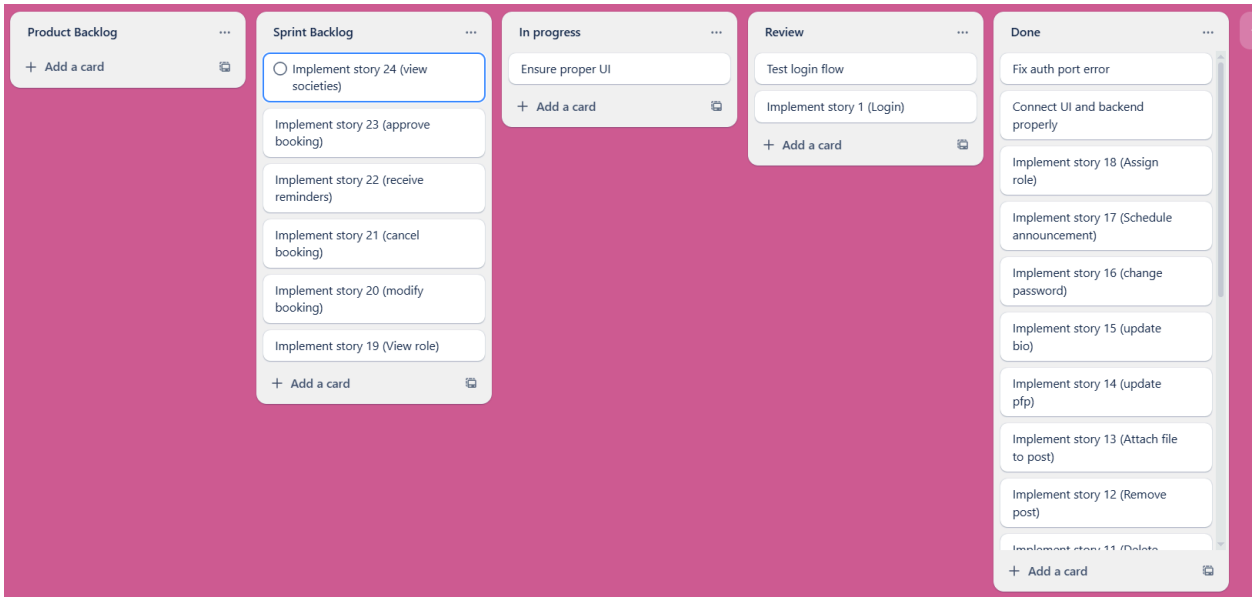


TRELLO SCREENSHOTS

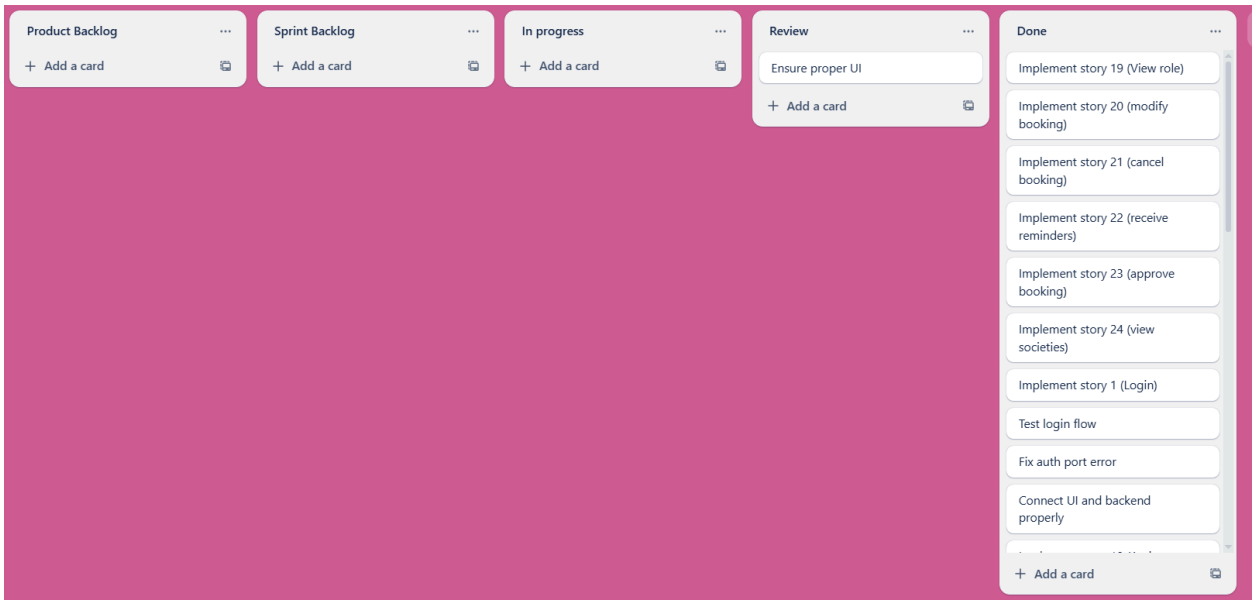
After Sprint 1



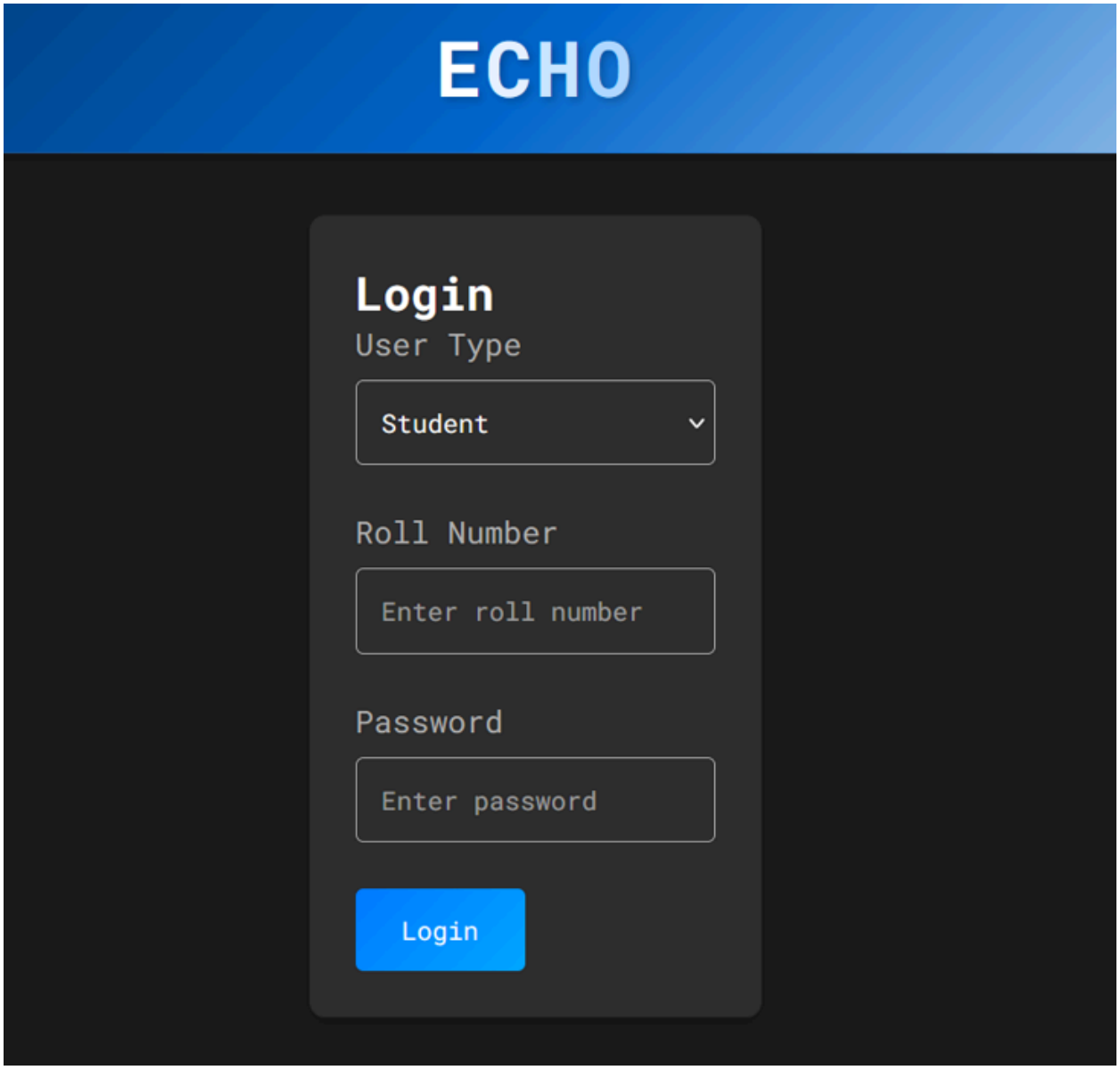
After Sprint 2

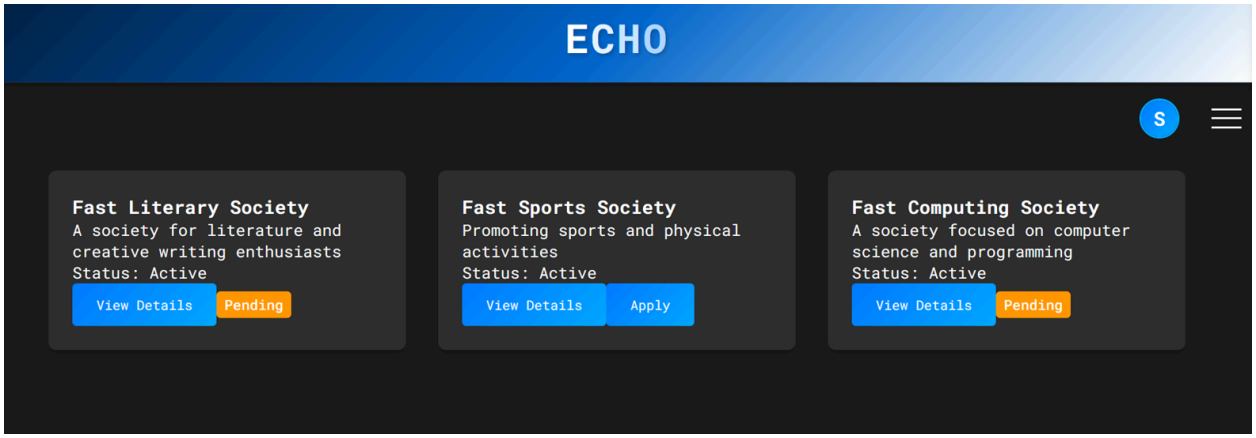


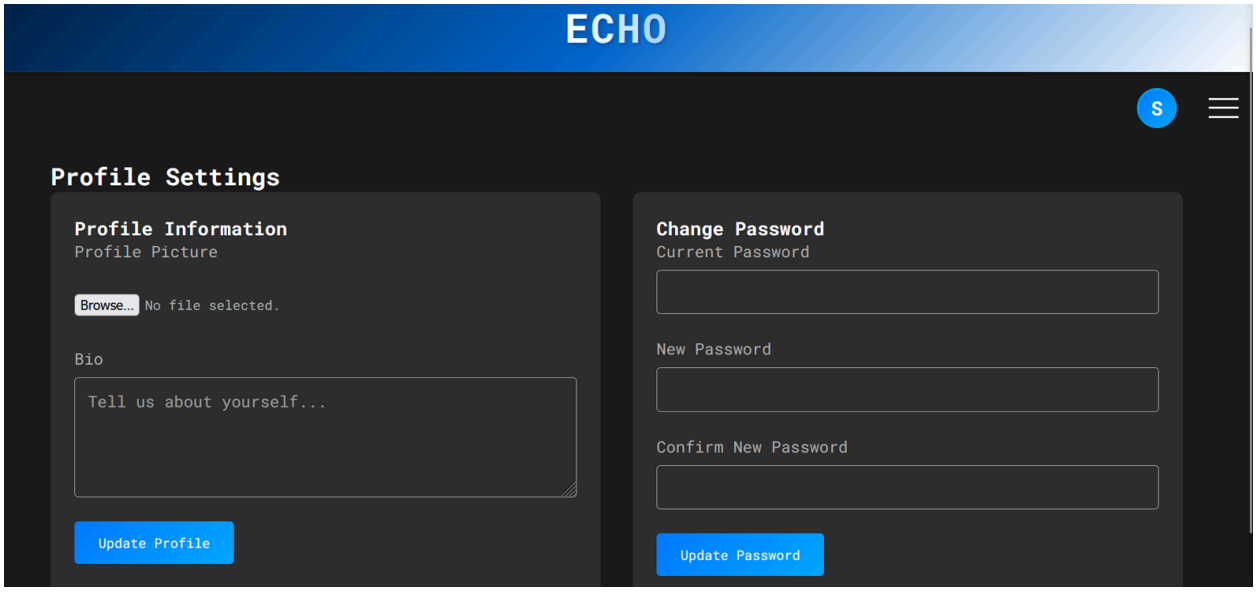
After Sprint 3



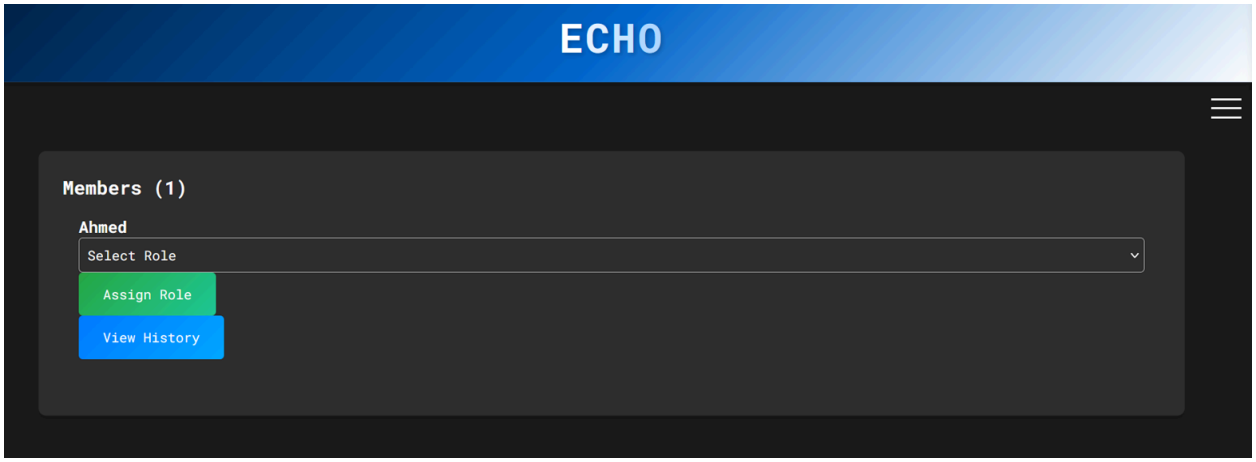
GUI FIELDS

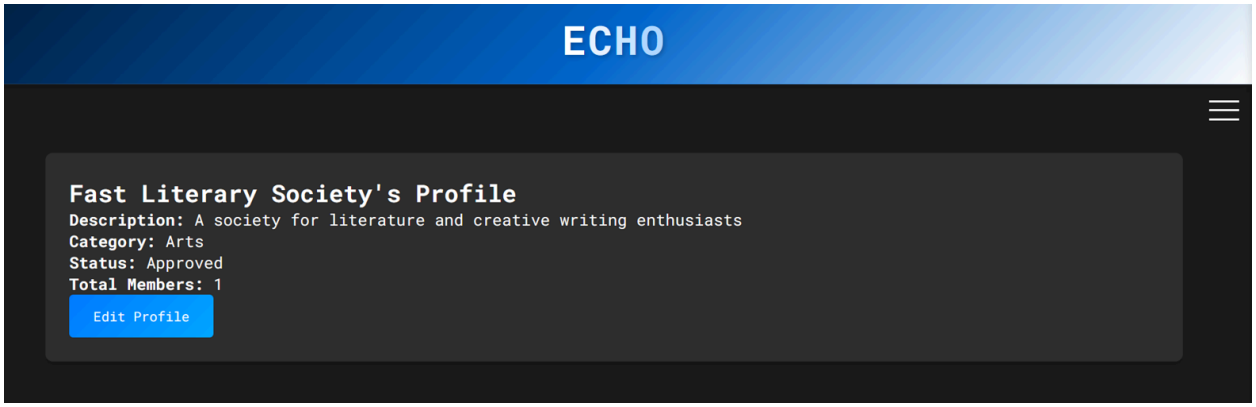

ECHO
Login
User Type
Student
Roll Number
Enter roll number
Password
Enter password
Login

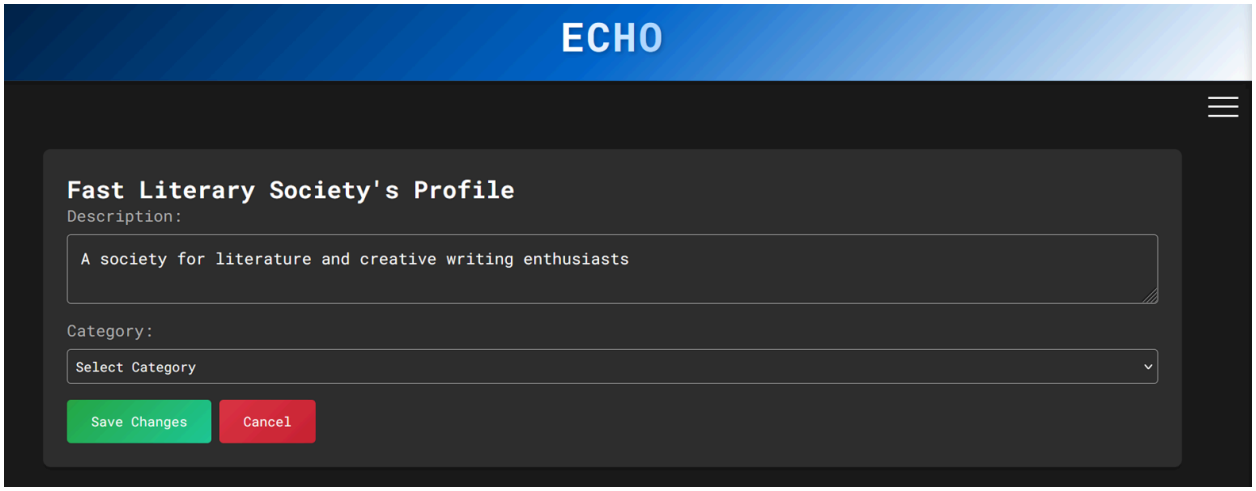

ECHO
S
Fast Literary Society
A society for literature and creative writing enthusiasts
Status: Active
View Details
Pending
Fast Sports Society
Promoting sports and physical activities
Status: Active
View Details
Apply
Fast Computing Society
A society focused on computer science and programming
Status: Active
View Details
Pending

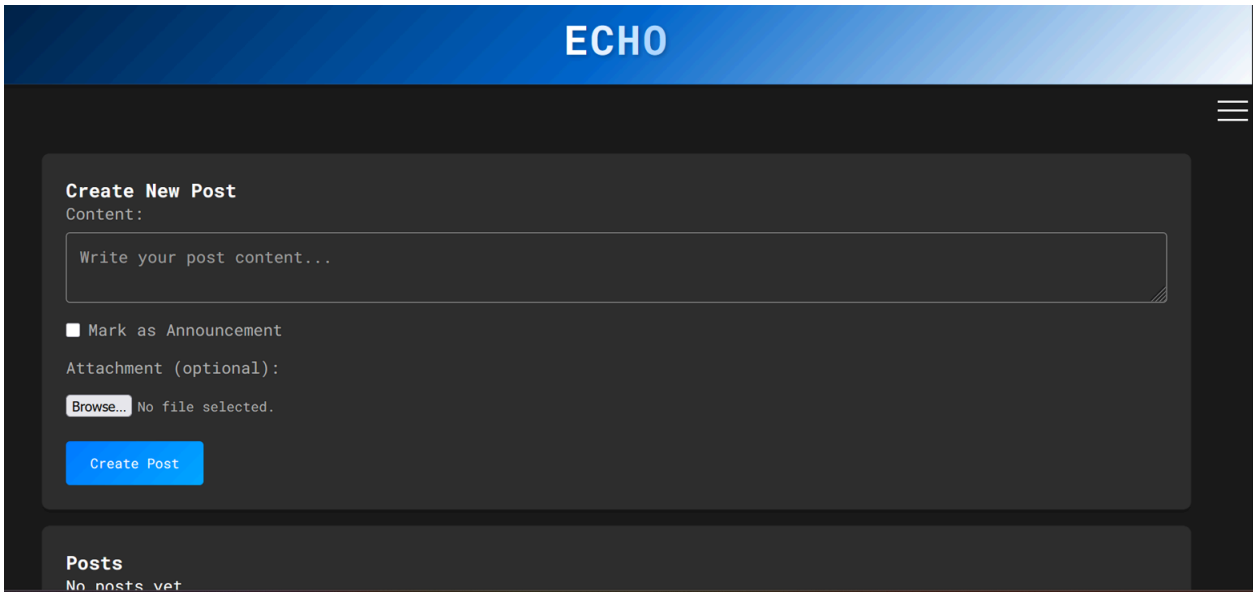

ECHO
S
Profile Settings
Profile Information
Profile Picture
Browse...
No file selected.
Bio
Tell us about yourself...
Update Profile
Change Password
Current Password
New Password
Confirm New Password
Update Password

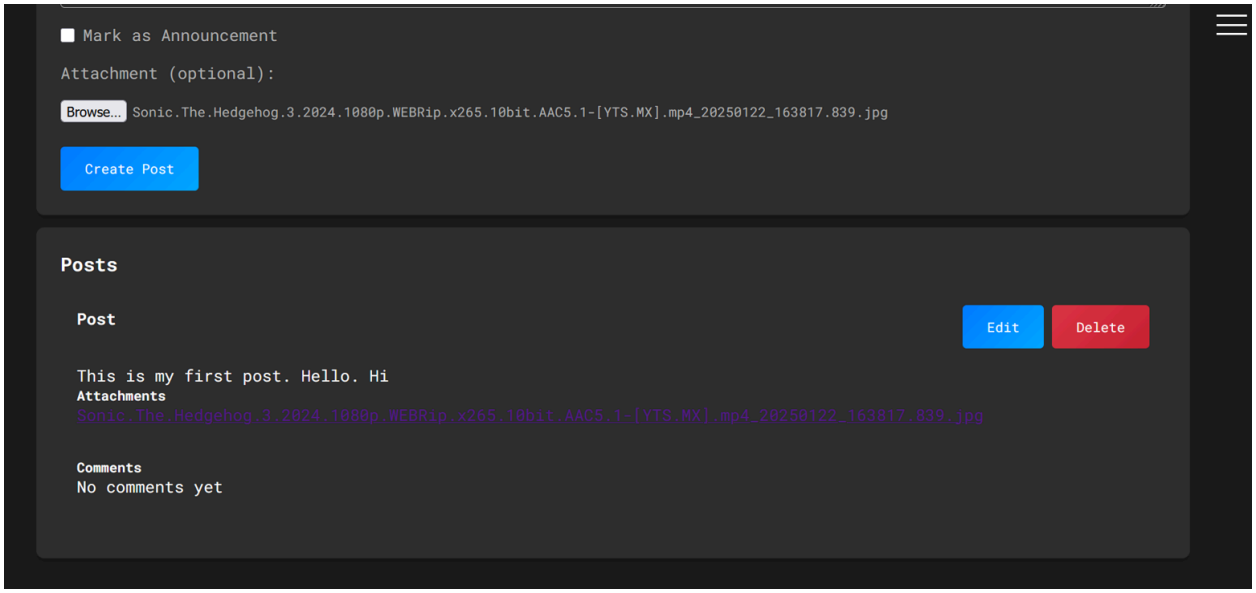
ECHO
Pending Applications
Ahmed
View History
Approve
Reject
Members (0)

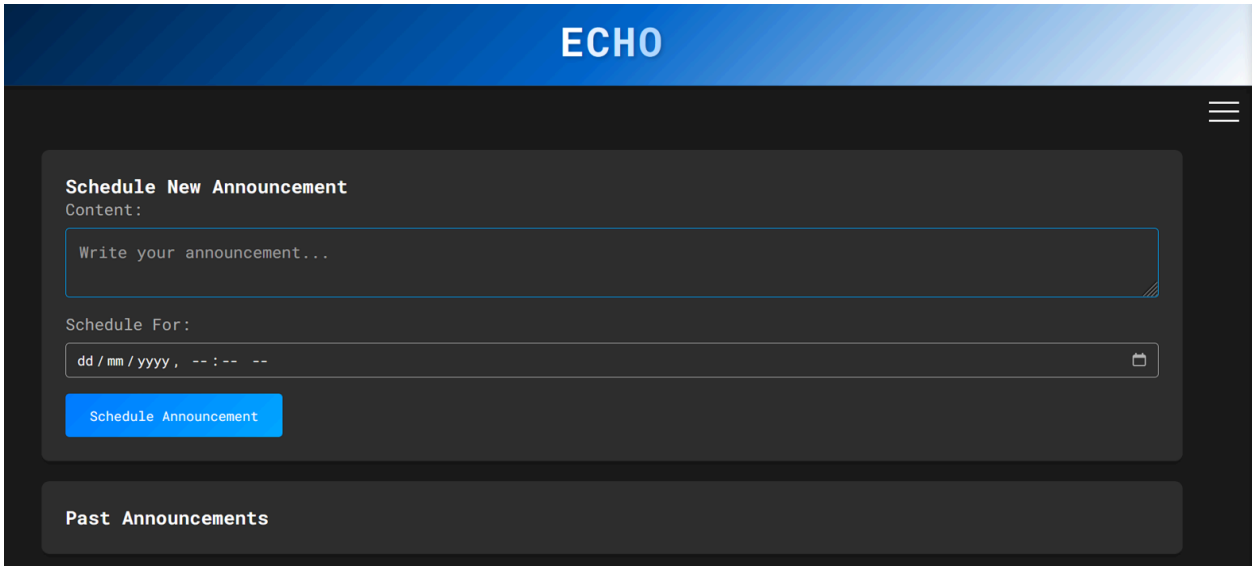

ECHO
Members (1)
Ahmed
Select Role
Assign Role
View History

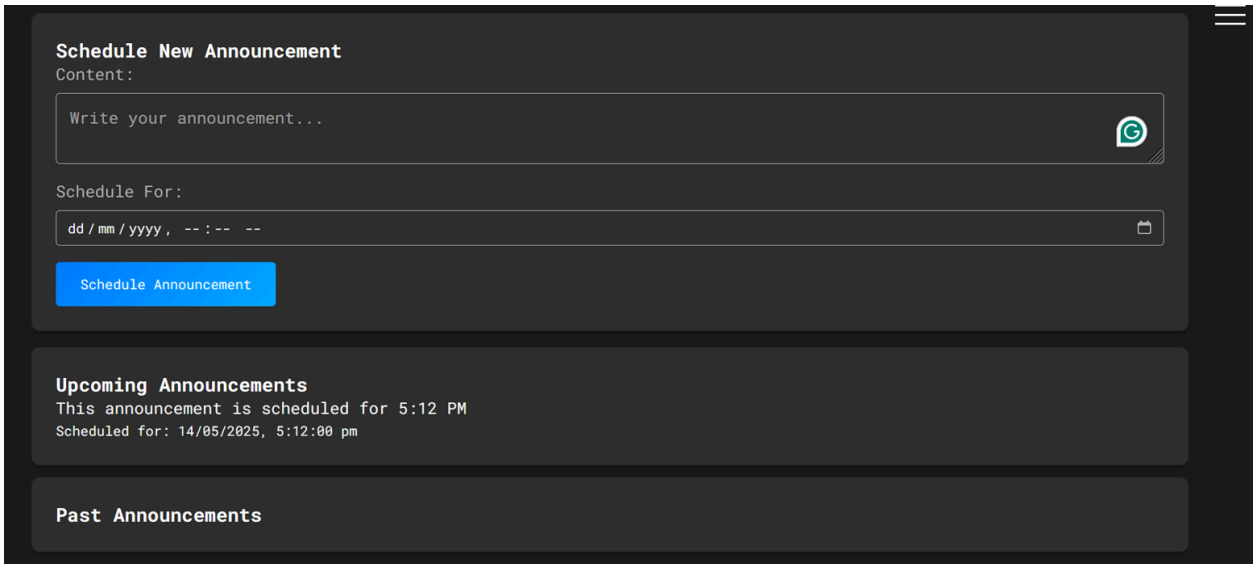

ECHO
Fast Literary Society's Profile
Description: A society for literature and creative writing enthusiasts
Category: Arts
Status: Approved
Total Members: 1
Edit Profile

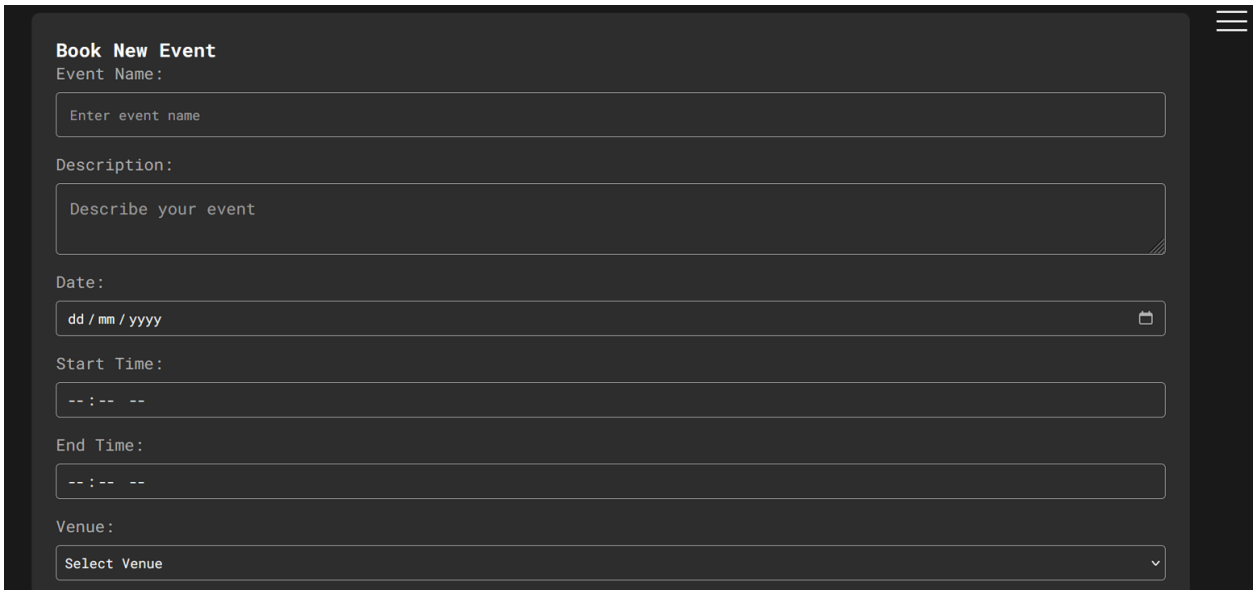

ECHO
Fast Literary Society's Profile
Description:
A society for literature and creative writing enthusiasts
Category:
Select Category
Save Changes
Cancel

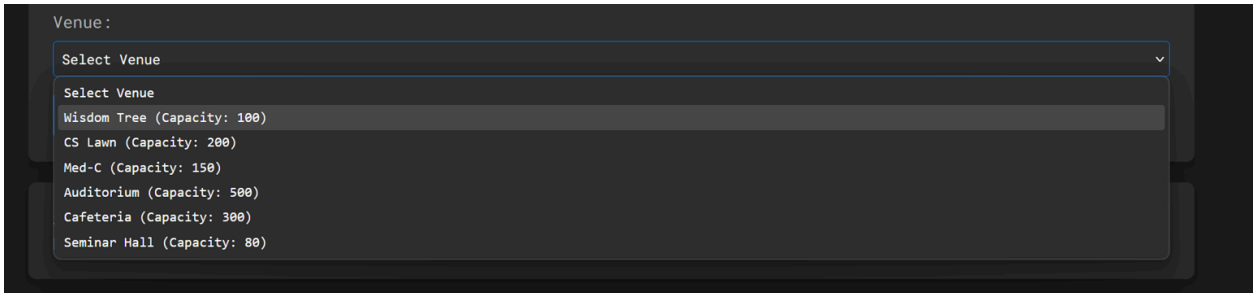

ECHO
Create New Post
Content:
Write your post content...
Mark as Announcement
Attachment (optional):
Browse... No file selected.
Create Post
Posts
No posts yet


Mark as Announcement
Attachment (optional):
Browse... Sonic.The.Hedgehog.3.2024.1080p.WEBRip.x265.10bit.AAC5.1-[YTS.MX].mp4_20250122_163817.839.jpg
Create Post
Posts
Post
Edit
Delete
This is my first post. Hello. Hi
Attachments
Sonic.The.Hedgehog.3.2024.1080p.WEBRip.x265.10bit.AAC5.1-[YTS.MX].mp4_20250122_163817.839.jpg
Comments
No comments yet


ECHO
Schedule New Announcement
Content:
Write your announcement...
Schedule For:
dd / mm / yyyy , -- : -- --
Schedule Announcement
Past Announcements

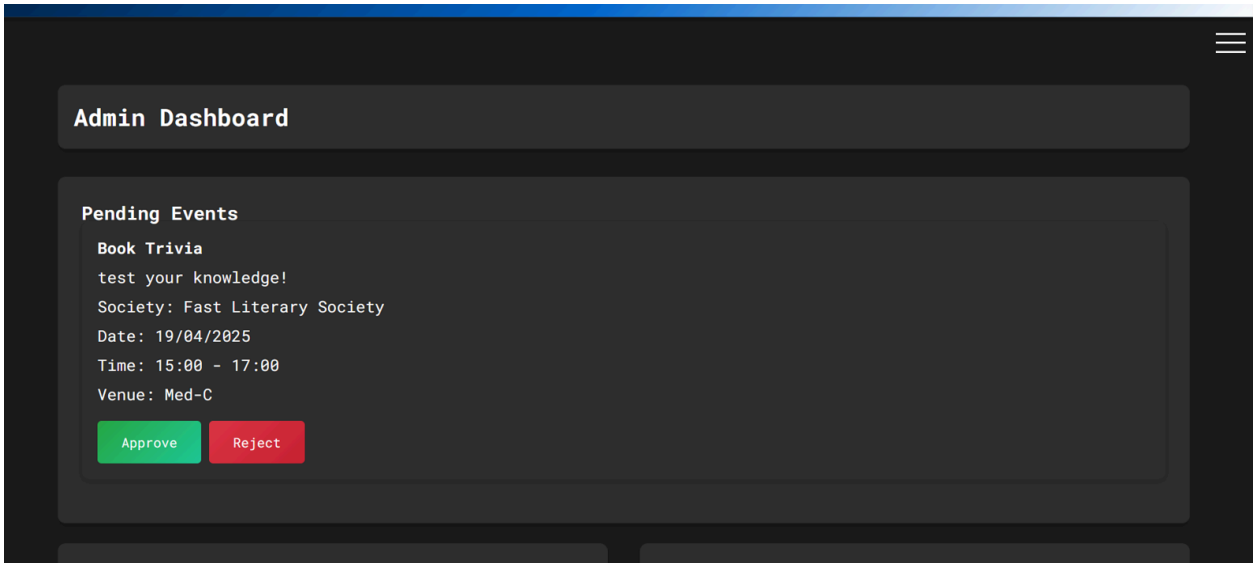

Schedule New Announcement
Content:
Write your announcement...
Schedule For:
dd / mm / yyyy , -- : -- --
Schedule Announcement
Upcoming Announcements
This announcement is scheduled for 5:12 PM
Scheduled for: 14/05/2025, 5:12:00 pm
Past Announcements

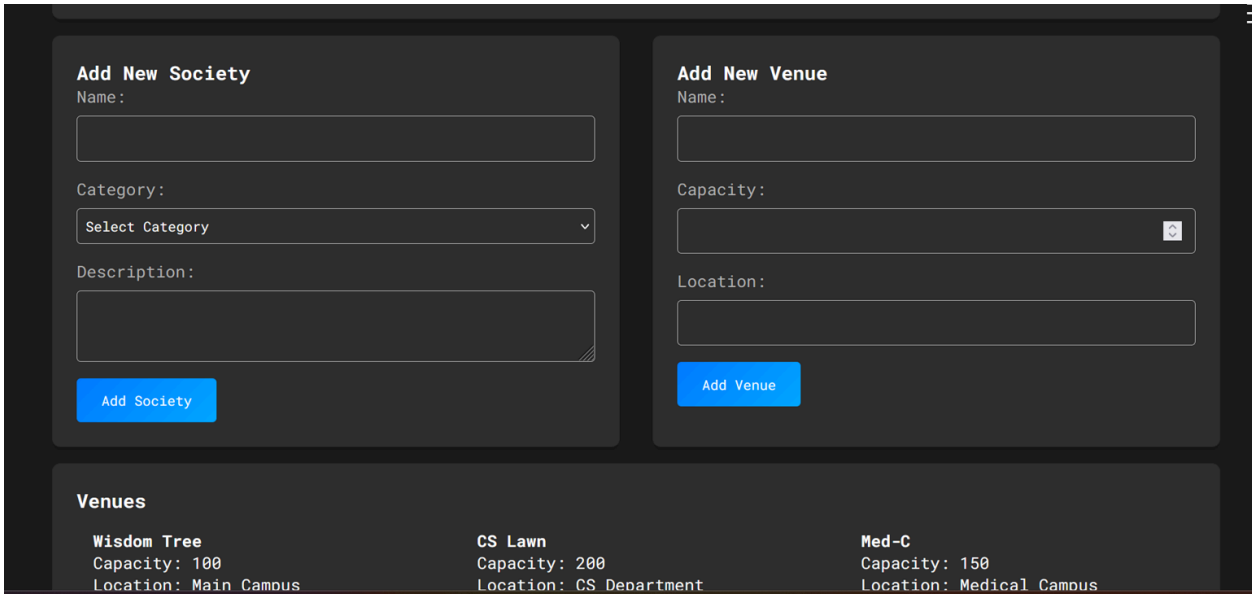

Book New Event
Event Name:
Enter event name
Description:
Describe your event
Date:
dd / mm / yyyy
Start Time:
--:-- --
End Time:
--:-- --
Venue:
Select Venue

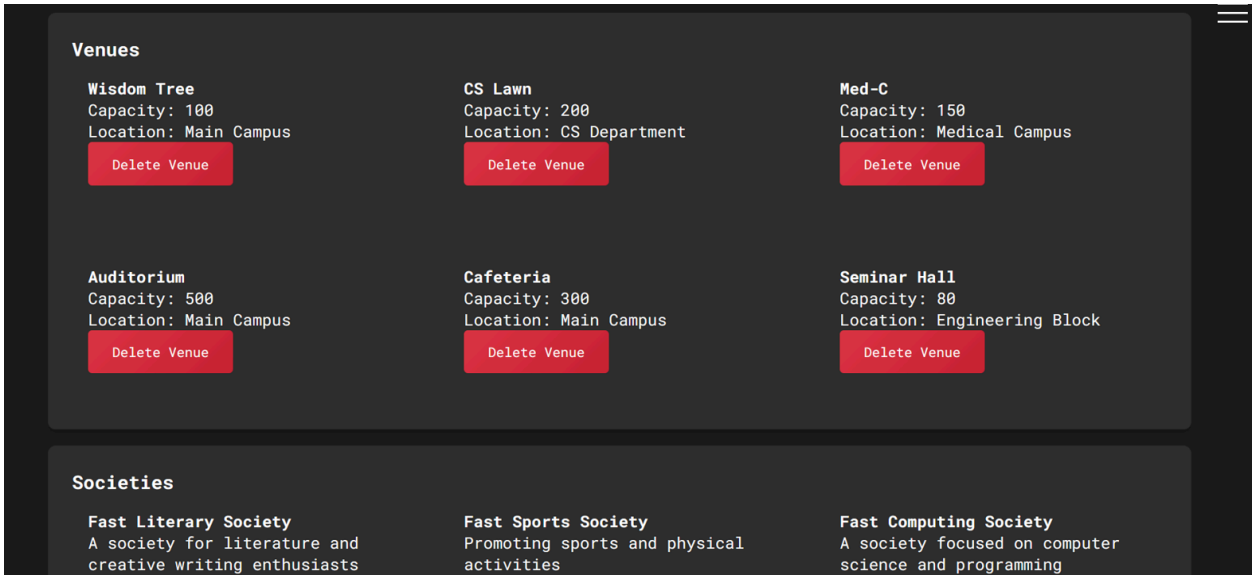

Venue:
Select Venue
Select Venue
Wisdom Tree (Capacity: 100)
CS Lawn (Capacity: 200)
Med-C (Capacity: 150)
Auditorium (Capacity: 500)
Cafeteria (Capacity: 300)
Seminar Hall (Capacity: 80)

End Time:
--:-- --
Venue:
Select Venue
Book Event
Society Events
Book Trivia
test your knowledge!
Date: 19/04/2025
Time: 15:00 - 17:00
Venue: Med-C
Status: Pending

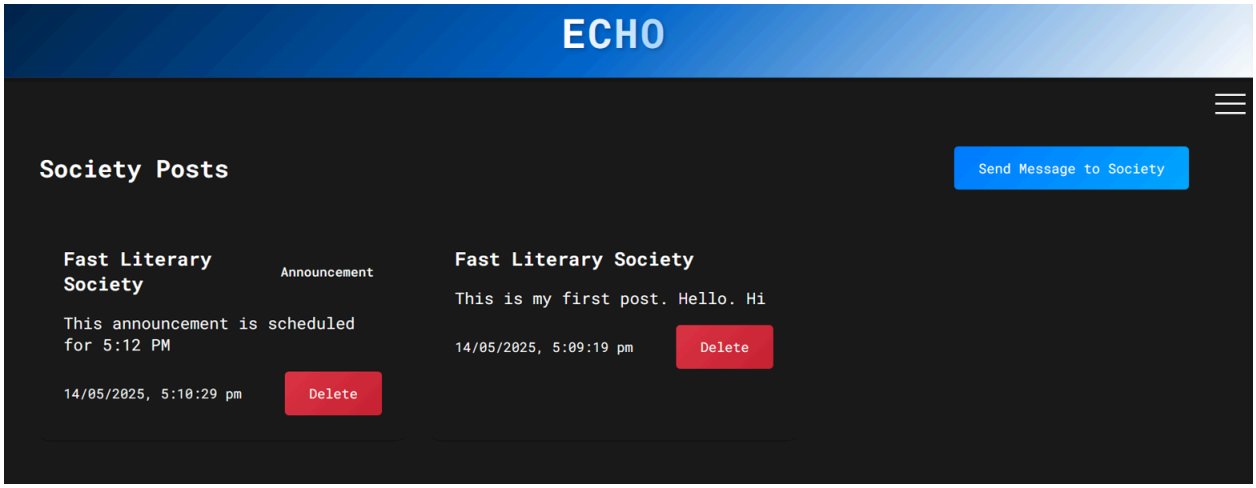
ECHO
Members (1)
Ahmed
Role: President
Remove Role
View History


Admin Dashboard
Pending Events
Book Trivia
test your knowledge!
Society: Fast Literary Society
Date: 19/04/2025
Time: 15:00 - 17:00
Venue: Med-C
Approve
Reject


Add New Society
Name:
Category:
Select Category
Description:
Add Society
Add New Venue
Name:
Capacity:
Location:
Add Venue
Venues
Wisdom Tree
Capacity: 100
Location: Main Campus
CS Lawn
Capacity: 200
Location: CS Department
Med-C
Capacity: 150
Location: Medical Campus


Venues
Wisdom Tree
Capacity: 100
Location: Main Campus
Delete Venue
CS Lawn
Capacity: 200
Location: CS Department
Delete Venue
Med-C
Capacity: 150
Location: Medical Campus
Delete Venue
Auditorium
Capacity: 500
Location: Main Campus
Delete Venue
Cafeteria
Capacity: 300
Location: Main Campus
Delete Venue
Seminar Hall
Capacity: 80
Location: Engineering Block
Delete Venue
Societies
Fast Literary Society
A society for literature and creative writing enthusiasts
Fast Sports Society
Promoting sports and physical activities
Fast Computing Society
A society focused on computer science and programming

All Events
Book Trivia
test your knowledge!
Society: Fast Literary Society
Date: 19/04/2025
Time: 15:00 - 17:00
Venue: Med-C
Status: Pending



EQUIVALENCE CLASS PARTITIONING & BOUNDARY VALUE ANALYSIS

User Story 1: Login

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Email	Follows <city><batch><four digit number> format	Does not follow <city><batch><four digit number> format
Password	8-20 chars, includes letters and numbers	Length <8, >20, no alphanumeric mix

Input	Boundary Value
Password	Length>0 (accepted), Length=20 (accepted)

User Story 2

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Comment	0<Length<=300	0=Length>300

Input	Boundary Value
Comment	Length=0 (accepted), Length=300(accepted)

User Story 3

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Delete Comment	Comment exists & belongs to user	Comment doesn't exist or belongs to another user

Input	Boundary Value
Delete comment	Own comment (allowed) vs. someone else's (forbidden)

User Story 4

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Moderate Comments	Owner of post	Not owner of post

Input	Boundary Value
Moderate Comment	Admin (allowed) vs. non-admin (denied)

User Story 5

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Application Status	Application exists (Pending, Approved, Rejected)	Application does not exist

Input	Boundary Value
Application Status	Pending, approved, rejected (all valid) vs. any other string (invalid)

User Story 6

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Cancel application	Application is pending	Application is not pending

Input	Boundary Value
Cancel application	Pending (allowed) vs. approved or rejected (forbidden) vs. no record (error)

User Story 7

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Approve/Reject Application	Role is Society being applied to	Role is not Society being applied to

Input	Boundary Value
Approve/Reject Application	Society (allowed) vs. non-Society (denied)

User Story 8

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Confirm before leaving	Member of society presses the leave society button.	Leave society button is not pressed.

Input	Boundary Value
Confirm before leaving	0 (no prompt) vs. ≥ 1 (prompt displayed)

User Story 9

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Track History	User has>=1 memberships/role assignments	User has no history

Input	Boundary Value
Track History	0 records (empty list) vs. 1 record vs. many records (e.g. > 100)

User Story 10

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Edit post	Post exists. Role is owner of post	Post does not exist. Role is not owner of post.

Input	Boundary Value
Edit post	Own post (allowed) vs. others' (forbidden)

User Story 11

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Delete post	Post exists. Role is owner of post	Post does not exist. Role is not owner of post.

Input	Boundary Value
Delete post	Own post (allowed) vs. others'

	(forbidden)

User Story 12

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Remove post	Post exists. Role is admin	Post does not exist. Role is not admin

Input	Boundary Value
Remove post	Admin (allowed) vs. non-admin (denied)

User Story 13

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Attach file to post	File type = {pdf, docx,txt,jpeg,png,gif}	File type ≠ {pdf, docx,txt,jpeg,png,gif}

Input	Boundary Value
Attach file to post	pdf/docx/jpg (valid) vs. exe/zip (invalid)

User Story 14

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Update profile picture	File type = {jpeg, png}. Role is account owner.	File is not an image. Role is not owner of account.

Input	Boundary Value
Update profile picture	jpg/png (valid) vs. gif/tiff (invalid)

User Story 15

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Update bio	0>Length>=500	0=Length>500

Input	Boundary Value
Update bio	(0–500): 0 chars (valid) / 1 char (valid) / ... / 500 chars (valid) / 501 chars (invalid)

User Story 16

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Change password	Current password input matches user password. New password is confirmed	Current password input does not match user password. New password is not confirmed.

Input	Boundary Value
Change password	Exactly correct (valid) vs. one-char off (invalid)

User Story 17

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Schedule announcement	Valid time and date input	Invalid time and date input

Input	Boundary Value
Schedule announcement	Now–1 min (invalid) / now (boundary, invalid if strictly future) / now+1 min (valid)

User Story 18

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Assign role	Role exists in society.	Role does not exist.

Input	Boundary Value
Assign role	Allowed set member (“Member”, “President”) vs. disallowed (“FooRole”)

User Story 19

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
View role in society	Accepted into society	Not a member of society

Input	Boundary Value
View role in society	0 societies (empty result) vs. 1 society vs. many societies

User Story 20

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Modify venue booking	Venue exists. Time and date are valid.	Venue does not exist. Time and date are invalid.

Input	Boundary Value
Modify venue booking	Booking exists: yes vs. no

User Story 21

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes

Cancel booking	Booking exists. Role is admin	Booking does not exist. Role is not admin

Input	Boundary Value
Cancel booking	Confirmed (valid) vs. pending or canceled (invalid) vs. no booking (error)

User Story 22

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Message society	Role is admin. Society exists	Role is not admin. Society does not exist.

Input	Boundary Value
Message society	Admin (allowed) vs. non-admin (denied)

User Story 23

Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
Approve venue booking	Booking exists. Role is admin	Booking does not exist. Role is not admin

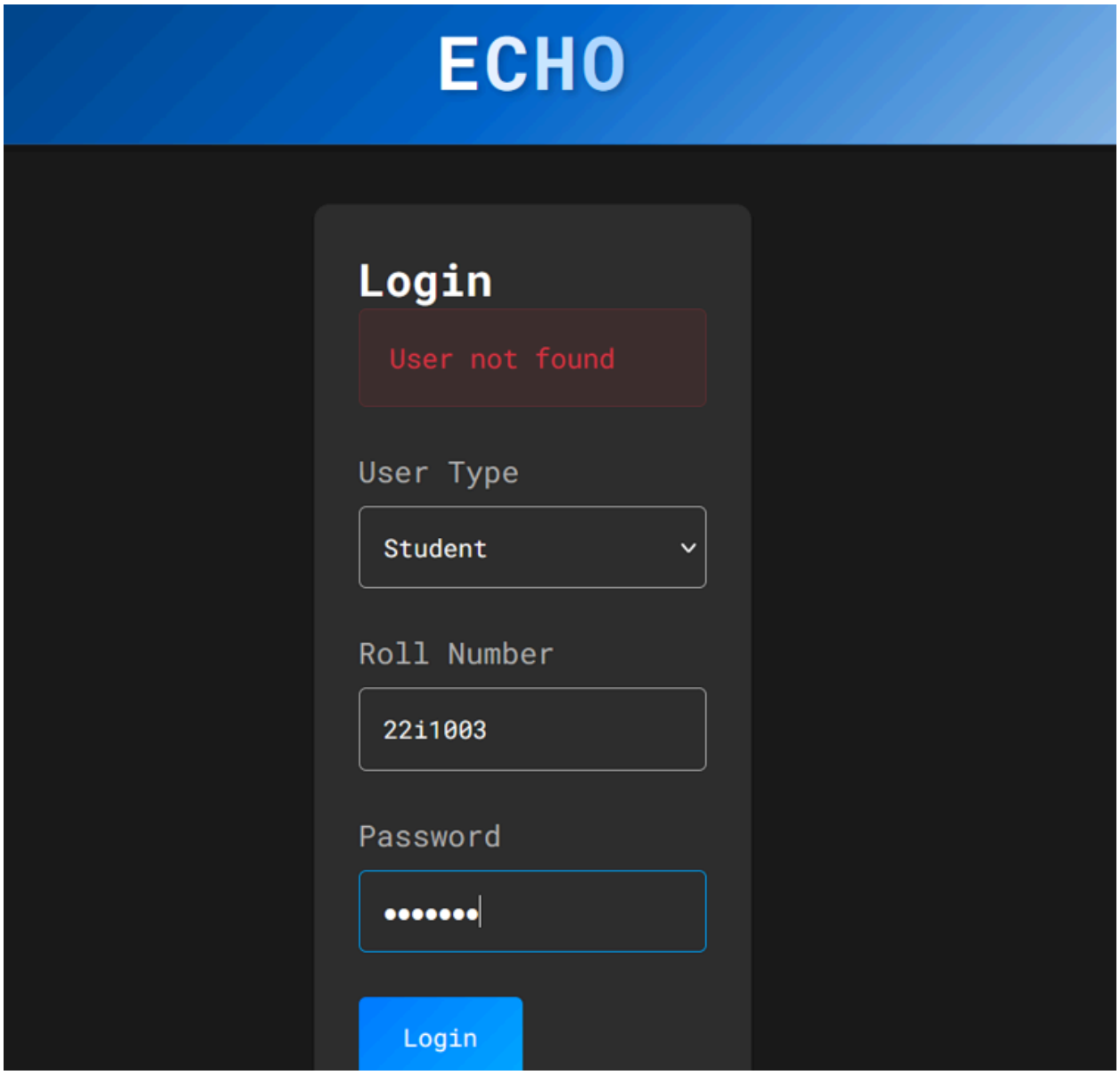
Input	Boundary Value
Approve venue booking	Admin & pending (valid) vs. admin & non-pending (invalid) vs. non-admin (invalid)

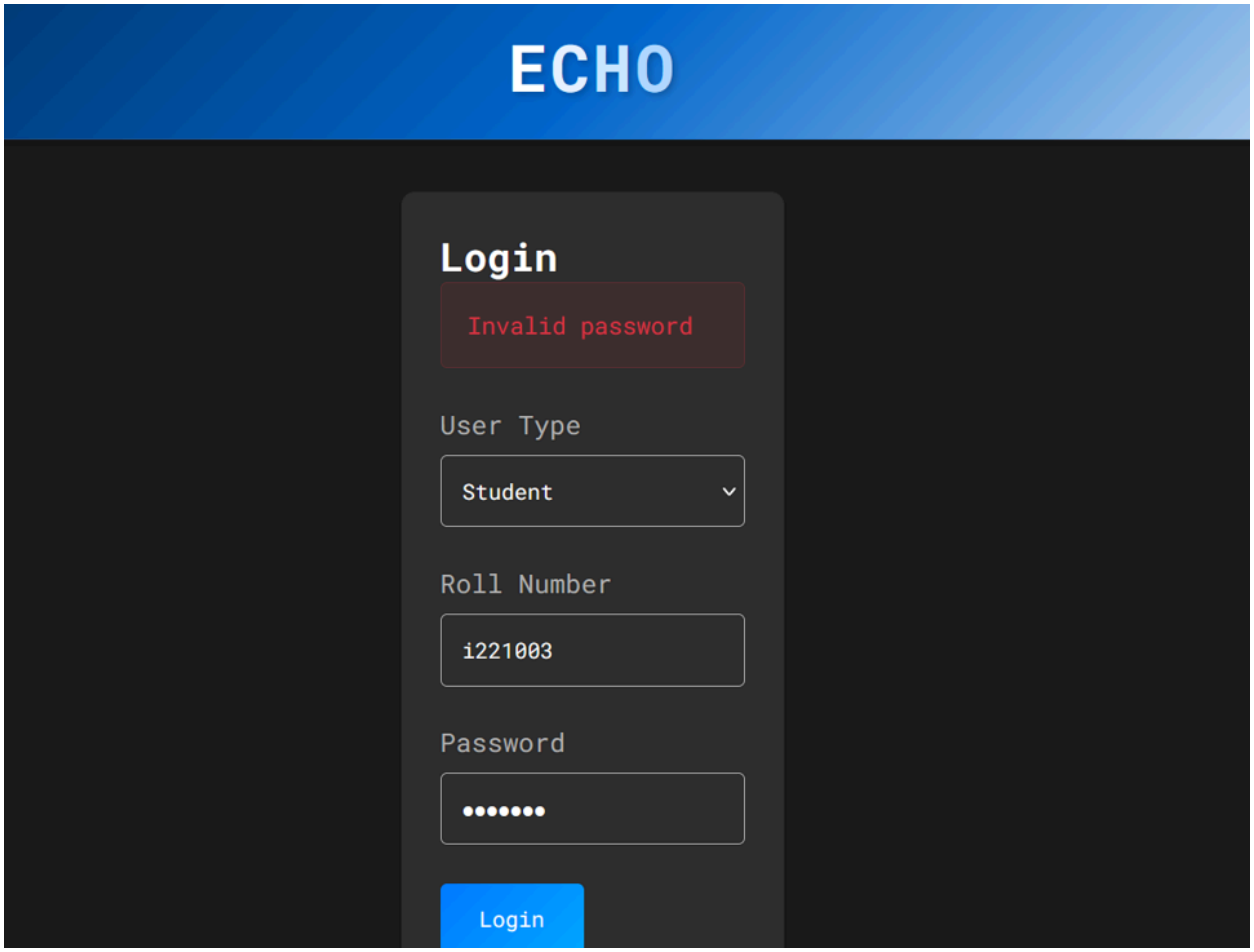
User Story 24

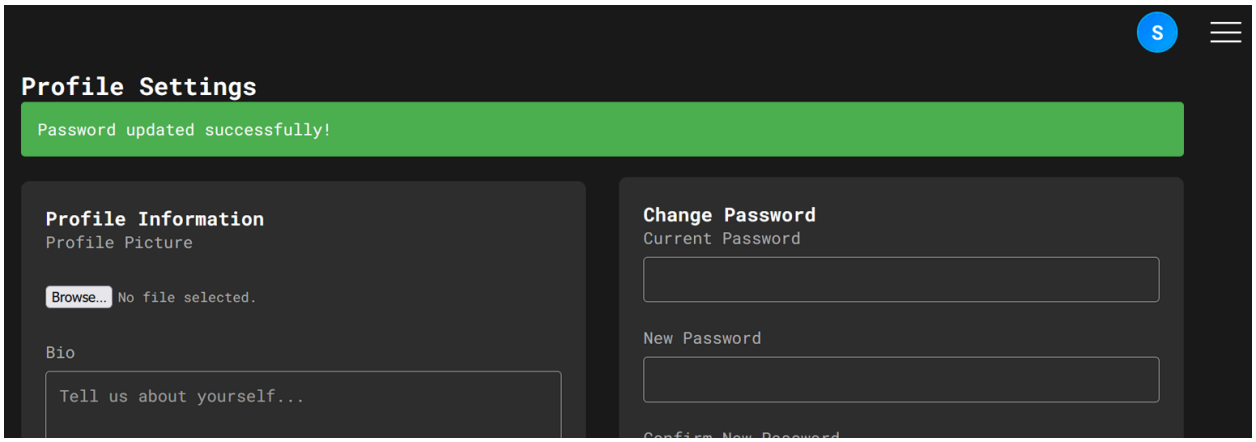
Input Event	Valid Equivalence Classes	Invalid Equivalence Classes
View list of societies	Role is admin/student	Role is society.

Input	Boundary Value
View list of societies	0 (empty list) vs. 1 vs. many (e.g. > 50)

BLACKBOX TESTING OF GUI FIELDS




ECHO
Login
Invalid password
User Type
Student
Roll Number
i221003
Password
Login


S
Profile Settings
Password updated successfully!
Profile Information
Profile Picture
Browse...
No file selected.
Bio
Tell us about yourself...
Change Password
Current Password
New Password

Profile Settings

Profile updated successfully!

Profile Information

Profile Picture

Browse... No file selected.

Bio

I am updating my bio

Change Password

Current Password

New Password

Confirm New Password

Profile Settings

Profile updated successfully!

Profile Information

Profile Picture

Browse... Samurai Jack - S01E08 - VII_kv_20250210_190210.426.jpg

Change Password

Current Password

New Password

Confirm New Password

Posts

Post

Edit Delete

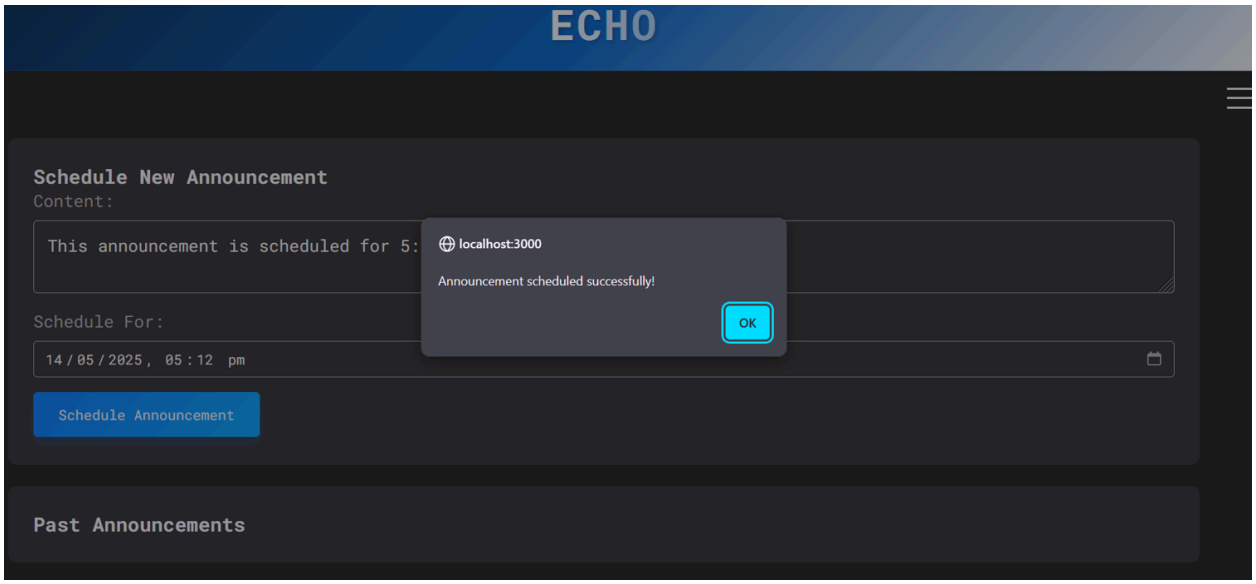
This is my first post. Hello. Hi

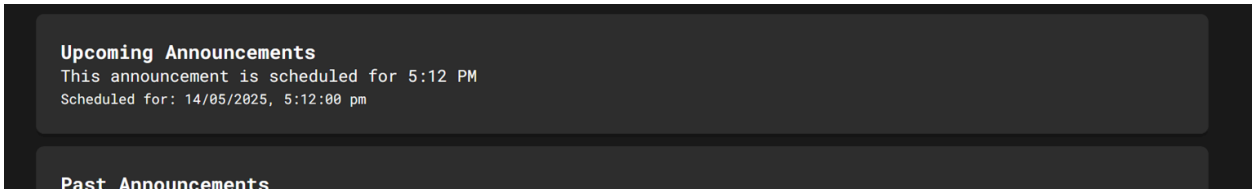
Attachments

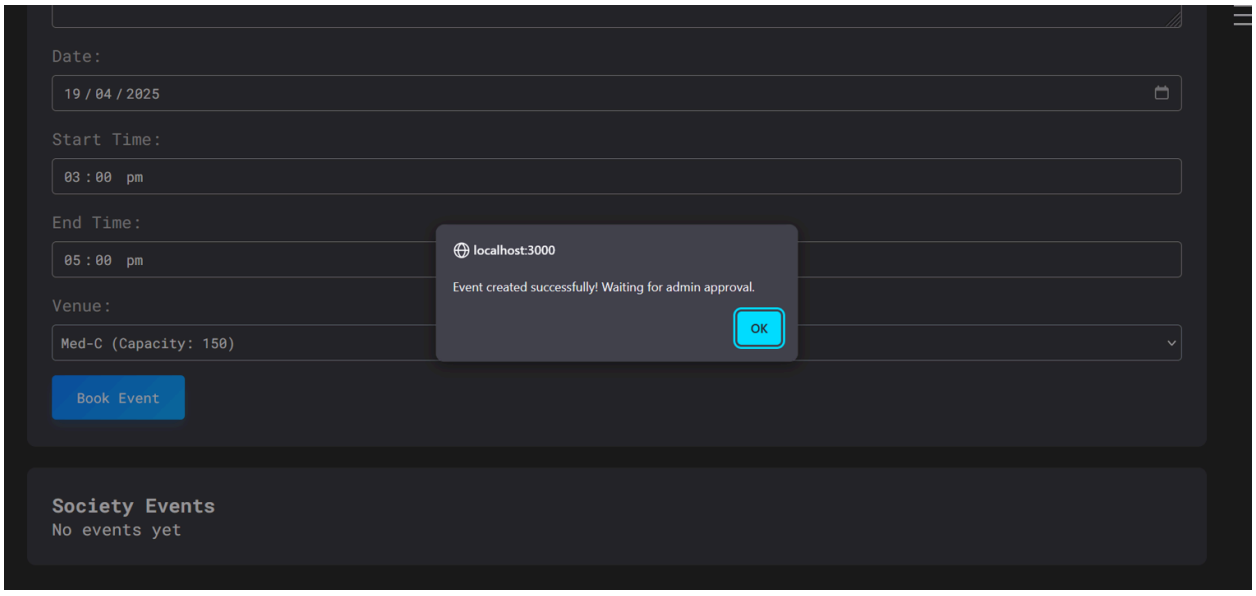
Sonic.The.Hedgehog.3.2024.1080p.WEBRip.x265.10bit.AAC5.1-[YTS.MX].mp4_20250122_163817.839.jpg

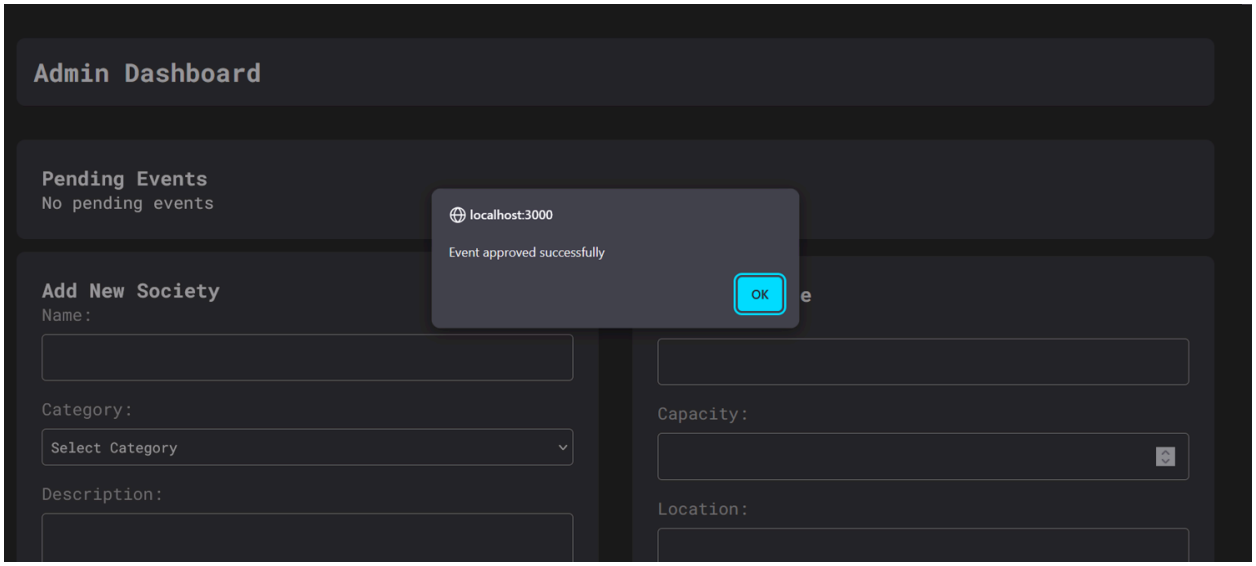
Comments

No comments yet


ECHO
Schedule New Announcement
Content:
This announcement is scheduled for 5:
localhost:3000
Announcement scheduled successfully!
OK
Schedule For:
14 / 05 / 2025 , 05 : 12 pm
Schedule Announcement
Past Announcements


Upcoming Announcements
This announcement is scheduled for 5:12 PM
Scheduled for: 14/05/2025, 5:12:00 pm
Past Announcements


Date:
19 / 04 / 2025
Start Time:
03 : 00 pm
End Time:
05 : 00 pm
localhost:3000
Event created successfully! Waiting for admin approval.
OK
Venue:
Med-C (Capacity: 150)
Book Event
Society Events
No events yet



PRODUCT REVIEW

The Echo Web app effectively addresses core needs for student-society and society-administration interactions in a university environment with secure authentication,

real-time content management, and role-based access control. Its strengths lie in a modular architecture (React frontend, Node.js backend) and features like event scheduling, venue booking, and file attachments. However, risks presented include UI inconsistencies and untested scalability under high traffic, during potentially popular events. While the platform excels in usability for students and societies, mobile responsiveness and bulk moderation tools are lacking. Security measures like JWT and password hashing are lacking, along with virus scanning for files. With targeted improvements in UI polish, performance optimization, and security enhancements, the platform has strong potential to become a cornerstone for academic collaboration. Future improvements can include styling consistencies, mobile availability, tools for bulk moderation, audit logs and virus scanning for files, and caching for high performance.

GitHub Repo

Demo video