

# Test Plan - University ERP System

## Test Environment

- **Java Version:** JDK 8 or higher
- **MySQL Version:** 8.0 or higher
- **Operating System:** Windows 10/11
- **Test Accounts:** See Database Setup section

## Test Accounts

| Username | Password | Role       | Purpose                     |
|----------|----------|------------|-----------------------------|
| admin    | admin123 | Admin      | Full system access testing  |
| inst1    | inst1_1  | Instructor | Instructor features testing |
| stu1     | stu1_1   | Student    | Student features testing    |
| stu2     | stu2_2   | Student    | Additional student testing  |

## Test Data

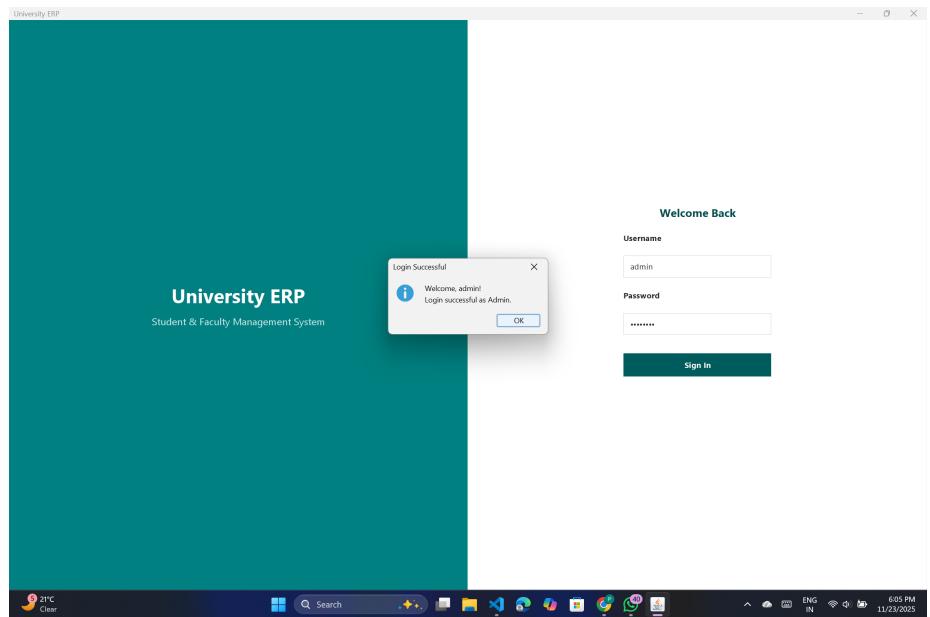
The seed data (`database/03_seed_data.sql`) includes:

- 1 Admin user - 1 Instructor user
- 2 Student users
- 5 Sample courses (CSE101, CSE201, CSE301, MTH301, ENG101)
- 7 Sample sections
- Sample enrollments for stu1 and stu2
- Sample grades for testing grade calculations

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## A. Login & Roles Tests

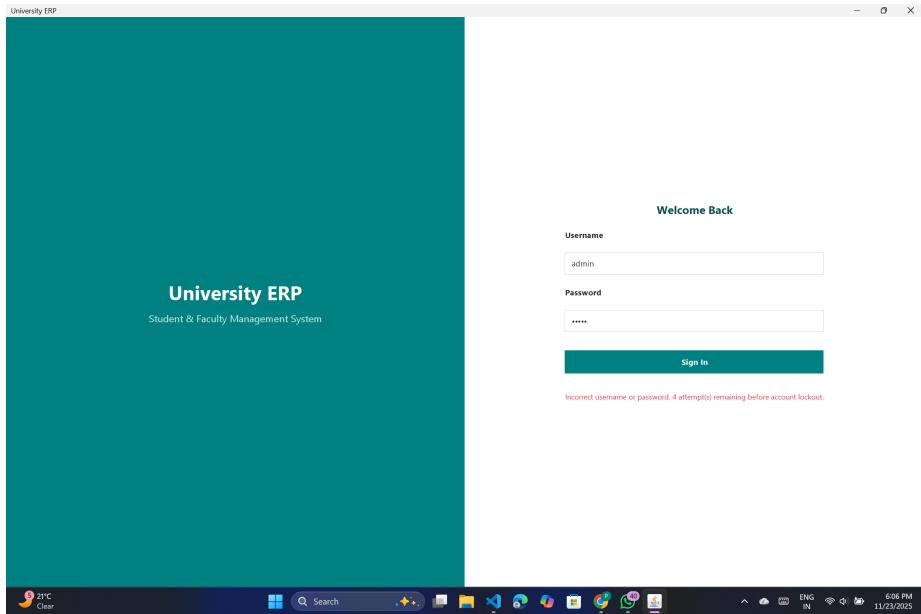
### Test Case L1: Successful Login



**Steps:** 1. Launch application 2. Enter username: **admin** 3. Enter password: **admin123** 4. Click “Login”

**Expected Result:** - Login successful message displayed - Admin Dashboard opens with correct menu items - User can see admin-specific features

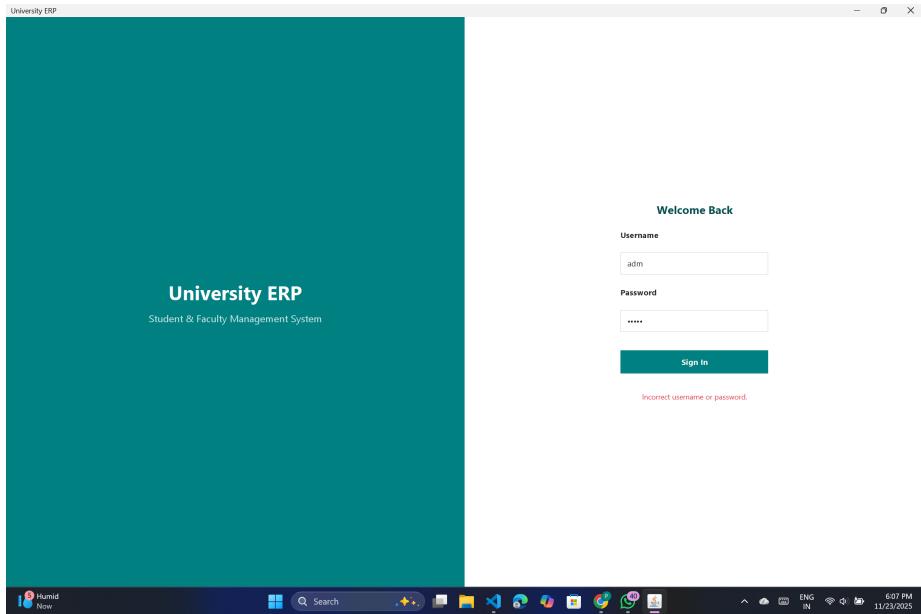
## Test Case L2: Wrong Password Rejected



**Steps:** 1. Launch application 2. Enter username: admin 3. Enter password: wrongpassword 4. Click "Login"

**Expected Result:** - Error message: "Incorrect username or password." - Login fails - Remains on login screen

### Test Case L3: Wrong Username Rejected



**Steps:** 1. Launch application 2. Enter username: nonexistent 3. Enter password: anypassword 4. Click “Login”

**Expected Result:** - Error message: “Incorrect username or password.” (same message for security) - Login fails

## Test Case L4: Role-Based Dashboards

**Admin Dashboard**

**Admin Portal**

- Manage Users
- Manage Courses
- Manage Sections
- Assign Instructor
- Maintenance Mode
- Backup/Restore
- Change Password
- Logout

Username:

Password:

Role:

Roll No:

Program:

Year:

Email:

**Add User**

| ID | Username | Role       | Status | Edit | Delete |
|----|----------|------------|--------|------|--------|
| 1  | admin    | ADMIN      | ACTIVE | Edit | Delete |
| 2  | inst1    | INSTRUCTOR | ACTIVE | Edit | Delete |
| 3  | stu1     | STUDENT    | ACTIVE | Edit | Delete |
| 4  | stu2     | STUDENT    | ACTIVE | Edit | Delete |

**Instructor Dashboard**

**Instructor Portal**

- My Sections
- Grade Entry (Live)
- Class Stats
- Export CSV
- Change Password
- Logout

| Section | Course                                    | Semester | Year | Capacity | Room    | Day               | Time        |
|---------|-------------------------------------------|----------|------|----------|---------|-------------------|-------------|
| A       | CSE101 - Introduction to Computer Science | Monsoon  | 2025 | 300      | LHC-101 | Monday, Wednesday | 09:00-10:30 |
| A       | CSE201 - Data Structures                  | Monsoon  | 2025 | 250      | LHC-201 | Tuesday           | 14:00-15:30 |
| A, B    | CSE401 - Database Systems                 | Monsoon  | 2025 | 650      | LHC-102 | Monday, Wednesday | 11:00-12:30 |
| B       | CSE101 - Introduction to Computer Science | Monsoon  | 2025 | 250      | LHC-201 | Monday, Wednesday | 09:00-10:30 |
| B       | CSE301 - Advanced Programming             | Monsoon  | 2025 | 300      | LHC-101 | Thursday          | 14:00-15:30 |

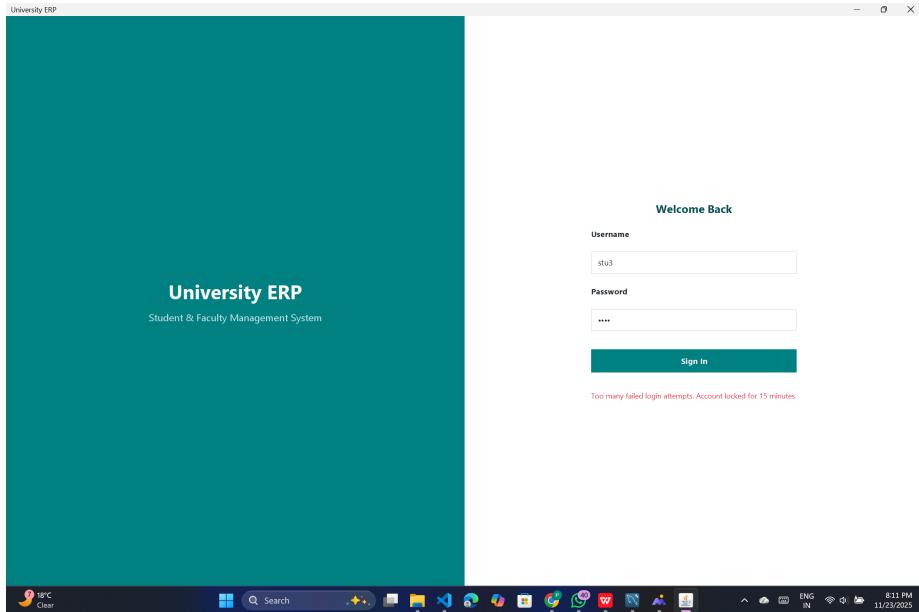
**Course Catalog**

| Course Code | Title                       | Credits | Section | Instructor | Capacity |
|-------------|-----------------------------|---------|---------|------------|----------|
| CSE101      | Introduction to Programming | 4       | A       | INST001    | 300      |
| CSE101      | Introduction to Programming | 4       | B       | INST001    | 250      |
| CSE201      | Data Structures             | 4       | A       | INST001    | 250      |
| CSE301      | Advanced Programming        | 4       | B       | INST001    | 300      |
| CSE401      | Database Systems            | 4       | A,B     | INST001    | 650      |
| MTH101      | Linear Algebra              | 4       | A       |            | 200      |
| SSH101      | Communication Skills        | 4       | A       |            | 300      |

**Steps:** 1. Login as **admin** → Verify Admin Dashboard opens 2. Logout, login as **inst1** → Verify Instructor Dashboard opens 3. Logout, login as **stu1** → Verify Student Dashboard opens

**Expected Result:** - Each role sees appropriate dashboard - Menu items match role capabilities - Role-specific panels are accessible

### Test Case L5: Login Lockout (Bonus Feature)



**Steps:** 1. Login with wrong password 5 times for **admin** 2. Try to login again with correct password

**Expected Result:** - After 5 failed attempts: “Too many failed login attempts. Account locked for 15 minutes.” - Cannot login even with correct password during lockout period - After 15 minutes, can login successfully

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## B. Student Tests

### Test Case S1: View Course Catalog

| Course Code | Title                       | Credits | Section | Instructor | Capacity |
|-------------|-----------------------------|---------|---------|------------|----------|
| CSE101      | Introduction to Programming | 4       | A       | INST001    | 300      |
| CSE101      | Introduction to Programming | 4       | B       | INST001    | 250      |
| CSE201      | Data Structures             | 4       | A       | INST001    | 250      |
| CSE301      | Advanced Programming        | 4       | B       | INST001    | 300      |
| CSE401      | Database Systems            | 4       | A,B     | INST001    | 650      |
| MTH101      | Linear Algebra              | 4       | A       |            | 200      |
| SSH101      | Communication Skills        | 4       | A       |            | 300      |

**Steps:** 1. Login as stu1 2. Navigate to “Course Catalog”

**Expected Result:** - Table displays courses with columns: Code, Title, Credits, Instructor, Capacity - All available courses are listed - Information is accurate

## Test Case S2: Register for Section

The screenshot shows the Student Portal dashboard on a Windows operating system. The main window displays a table of course sections with columns for Section Code, Course, Instructor, Available Seats, and Enroll (checkbox). A modal dialog box titled "Registration Results" indicates that section "A - Communication Skills" has been successfully registered. The taskbar at the bottom shows various application icons and the system clock.

| Section Code | Course                      | Instructor | Available Seats | Enroll                              |
|--------------|-----------------------------|------------|-----------------|-------------------------------------|
| B            | Advanced Programming        | inst1      | 299             | <input type="checkbox"/>            |
| A            | Communication Skills        |            | 300             | <input checked="" type="checkbox"/> |
| A, B         | Data Structures             | inst1      | 248             | <input type="checkbox"/>            |
| A            | Database Systems            | inst1      | 650             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 298             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 250             | <input type="checkbox"/>            |
| A            | Linear Algebra              |            | 200             | <input type="checkbox"/>            |

Register S...

**Steps:** 1. Login as stu1 2. Navigate to “Register Section” 3. Select a section with available seats (checkbox) 4. Click “Register Selected Sections”

**Expected Result:** - Success message displayed - Section appears in “My Timetable” - Section appears in “Drop Section” list - Available seats count decreases

### Test Case S3: Cannot Register Same Section Twice

The screenshot shows the Student Portal dashboard. On the left sidebar, under 'Student Portal', there are several options: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The 'Register Section' option is highlighted. The main area displays a table of course sections:

| Section Code | Course                      | Instructor | Available Seats | Enroll                              |
|--------------|-----------------------------|------------|-----------------|-------------------------------------|
| B            | Advanced Programming        | inst1      | 299             | <input type="checkbox"/>            |
| A            | Communication Skills        |            | 299             | <input checked="" type="checkbox"/> |
| A            | Data Structures             | inst1      | 248             | <input type="checkbox"/>            |
| A, B         | Database Systems            | inst1      | 650             | <input type="checkbox"/>            |
| A            | Introduction to Programming | inst1      | 298             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 250             | <input type="checkbox"/>            |
| A            | Linear Algebra              |            | 200             | <input type="checkbox"/>            |

A modal window titled 'Registration Results' appears, displaying a warning message: 'Registration failed: A (Communication Skills) Already enrolled'. There is an 'OK' button at the bottom of the modal.

**Steps:** 1. Login as stu1 2. Try to register for a section already enrolled in

**Expected Result:** - Error message: "Already enrolled in this exact section" - Registration is blocked - Enrollment status unchanged

### Test Case S4: Cannot Register in Full Section

The screenshot shows the Student Portal interface. On the left, a dark sidebar lists navigation options: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The main area displays a table of course sections:

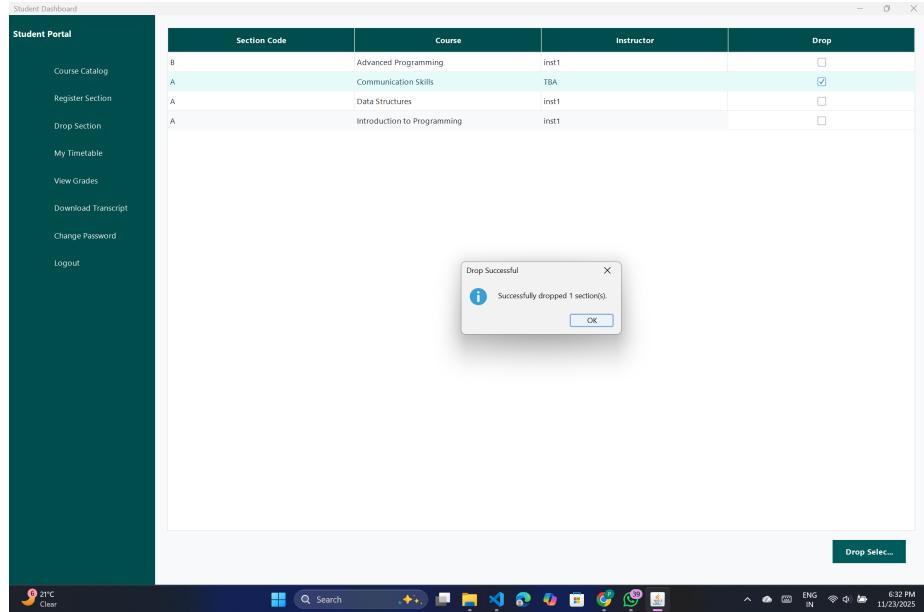
| Section Code | Course                      | Instructor | Available Seats | Enroll                              |
|--------------|-----------------------------|------------|-----------------|-------------------------------------|
| B            | Advanced Programming        | inst1      | 299             | <input type="checkbox"/>            |
| A            | Communication Skills        |            | 298             | <input type="checkbox"/>            |
| A            | Data Structures             | inst1      | 248             | <input type="checkbox"/>            |
| A, B         | Database Systems            | inst1      | 650             | <input type="checkbox"/>            |
| A            | Introduction to Programming | inst1      | 298             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 250             | <input type="checkbox"/>            |
| A            | Linear Algebra              |            | FULL            | <input checked="" type="checkbox"/> |

A modal dialog box titled "Registration Results" appears, containing a yellow warning icon and the message: "Registration failed: • A (Linear Algebra) Section is full". An "OK" button is at the bottom right of the dialog.

**Steps:** 1. Login as stu1 2. Find a section with 0 available seats (marked as "FULL") 3. Try to register

**Expected Result:** - Error message: "Section is full" - Registration is blocked

### Test Case S5: Drop Section



**Steps:** 1. Login as stu1 2. Navigate to “Drop Section” 3. Select an enrolled section (checkbox) 4. Click “Drop Selected Sections”

**Expected Result:** - Success message displayed - Section removed from “My Timetable” - Section removed from “Drop Section” list - Can register for same section again

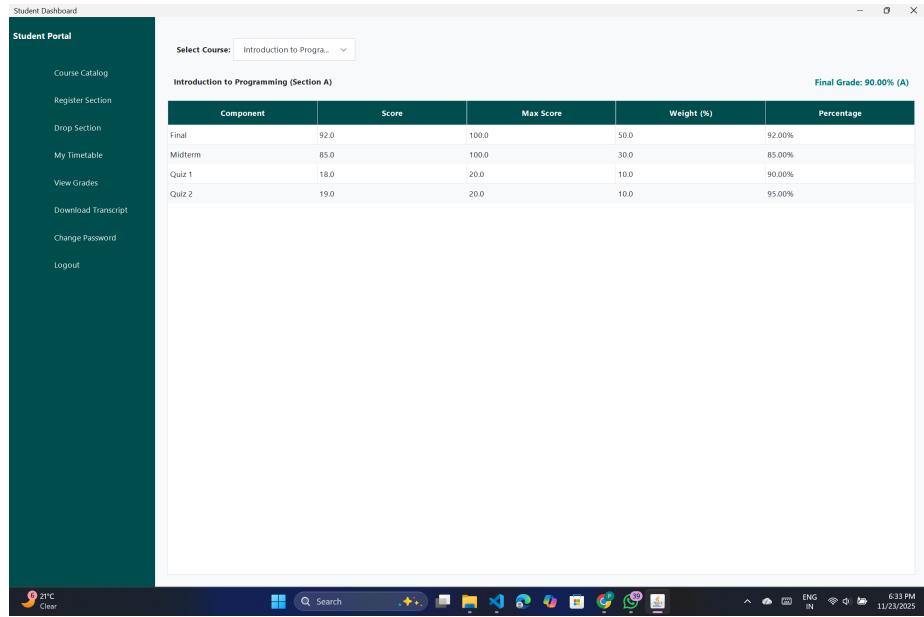
## Test Case S6: View Timetable

| Section | Course                      | Day               | Time        | Room    |
|---------|-----------------------------|-------------------|-------------|---------|
| A       | Introduction to Programming | Monday, Wednesday | 09:00-10:30 | LHC-101 |
| A       | Data Structures             | Tuesday           | 14:00-15:30 | LHC-201 |
| B       | Advanced Programming        | Thursday          | 14:00-15:30 | LHC-101 |

**Steps:** 1. Login as stu1 2. Navigate to “My Timetable”

**Expected Result:** - Table shows: Section, Course, Day, Time, Room - Only enrolled sections are displayed - Schedule information is correct

## Test Case S7: View Grades



The screenshot shows the Student Portal interface. On the left, a dark sidebar lists navigation options: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The main content area is titled "View Grades" and shows a table for the course "Introduction to Programming (Section A)". The table has columns for Component, Score, Max Score, Weight (%), and Percentage. The data is as follows:

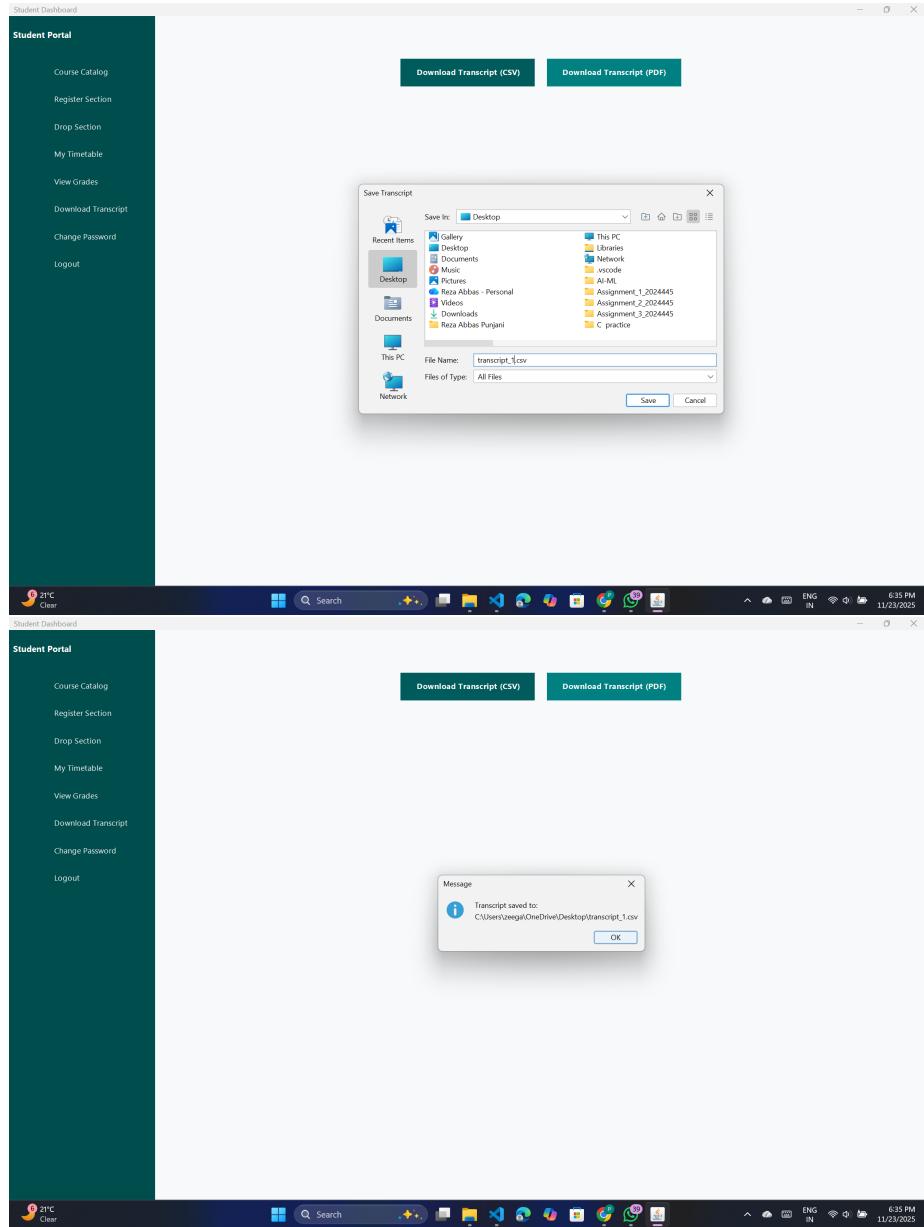
| Component | Score | Max Score | Weight (%) | Percentage |
|-----------|-------|-----------|------------|------------|
| Final     | 92.0  | 100.0     | 50.0       | 92.00%     |
| Midterm   | 85.0  | 100.0     | 30.0       | 85.00%     |
| Quiz 1    | 18.0  | 20.0      | 10.0       | 90.00%     |
| Quiz 2    | 19.0  | 20.0      | 10.0       | 95.00%     |

At the top right of the table, it says "Final Grade: 90.00% (A)". The system tray at the bottom shows the date as 11/23/2025.

**Steps:** 1. Login as stu1 2. Navigate to “View Grades” 3. Select a course from dropdown

**Expected Result:** - Grade components displayed: Component, Score, Max Score, Weight, Percentage - Final grade calculated and displayed (e.g., “Final Grade: 85.50% (B)”) - Letter grade shown correctly

## Test Case S8: Download Transcript (CSV)



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A1 Section Course Final Percentage Letter Grade

1 Section Course Final Percentage Letter Grade

2 B Advanced Programming 0 N/A

3 A Data Structures 90 A

4 A Introduction to Programming 90 A

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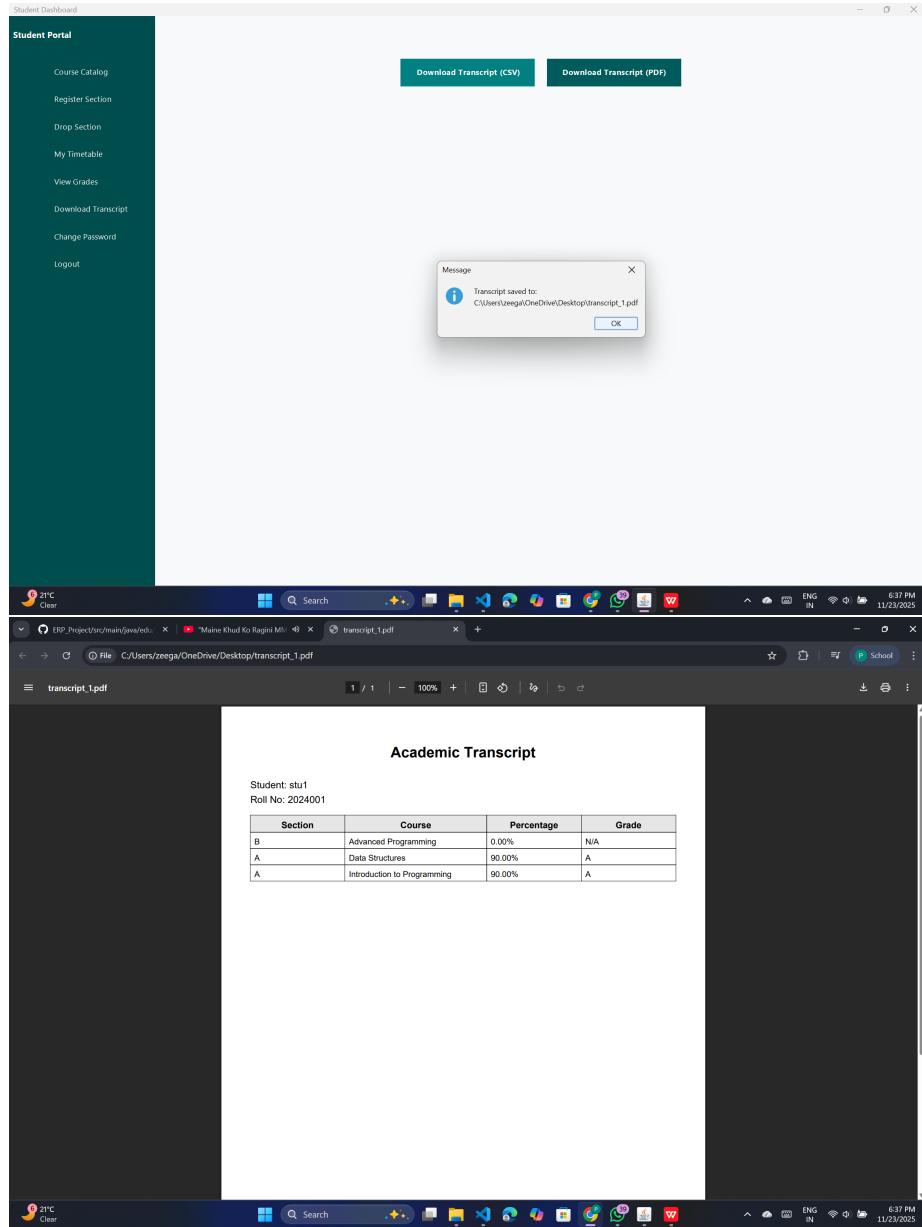
Search

100% 6:36 PM 11/23/2023 ENG IN WiFi

**Steps:** 1. Login as stu1 2. Navigate to “Download Transcript” 3. Click “Download Transcript (CSV)” 4. Choose save location 5. Open the CSV file

**Expected Result:** - File saves successfully - CSV contains: Section, Course, Final Percentage, Letter Grade - All enrolled courses are included - Grades are calculated correctly

### Test Case S9: Download Transcript (PDF)



**Steps:** 1. Login as `stu1` 2. Navigate to “Download Transcript” 3. Click “Download Transcript (PDF)” 4. Choose save location 5. Open the PDF file

**Expected Result:** - PDF file saves successfully - PDF contains student name, roll number - Table shows: Section, Course, Percentage, Grade - Formatting is clean and readable

## C. Instructor Tests

### Test Case I1: View Own Sections

The screenshot shows the Instructor Dashboard interface. On the left, a dark sidebar menu titled "Instructor Portal" contains links for "My Sections", "Grade Entry (Live)", "Class Stats", "Export CSV", "Change Password", and "Logout". The main content area displays a table titled "Instructor Dashboard" with the following data:

| Section | Course                              | Semester | Year | Capacity | Room              | Day         | Time |
|---------|-------------------------------------|----------|------|----------|-------------------|-------------|------|
| A       | CSE101 - Introduction to... Monsoon | 2025     | 300  | LHC-101  | Monday, Wednesday | 09:00-10:30 |      |
| A       | CSE201 - Data Structures Monsoon    | 2025     | 250  | LHC-201  | Tuesday           | 14:00-15:30 |      |
| A, B    | CSE401 - Database Syst... Monsoon   | 2025     | 650  | LHC-102  | Monday, Wednesday | 11:00-12:30 |      |
| B       | CSE101 - Introduction to... Monsoon | 2025     | 250  | LHC-201  | Monday, Wednesday | 09:00-10:30 |      |
| B       | CSE301 - Advanced Pro... Monsoon    | 2025     | 300  | LHC-101  | Thursday          | 14:00-15:30 |      |

**Steps:** 1. Login as `inst1` 2. Navigate to “My Sections”

**Expected Result:** - Table shows only sections assigned to `inst1` - Columns: Section, Course, Semester, Year, Capacity, Room, Day, Time - No other instructor's sections visible

## Test Case I2: Enter Scores

The screenshot shows the Instructor Portal dashboard. On the left, a sidebar lists 'My Sections', 'Grade Entry (Live)', 'Class Stats', 'Export CSV', 'Change Password', and 'Logout'. The main area is titled 'Select Section: A - Introduction to Prog...'. Below it, a 'Students' section shows 'Roll No: 2024001' (selected) and 'Roll No: 2024002'. A table titled 'Grades for: Roll No: 2024001' displays scores for 'Final', 'Midterm', 'Quiz 1', and 'Quiz 2'. A message box at the bottom right says 'Message' with 'OK' and 'Grades saved successfully for Roll No: 2024001'. Buttons at the bottom include 'Add Comp...', 'Delete Component', and 'Save Grades'. The taskbar at the bottom shows various icons and the date/time: 6:40 PM, 11/23/2025.

| Component | Score | Max Score | Weight (%) |
|-----------|-------|-----------|------------|
| Final     | 92.0  | 100.0     | 50.0       |
| Midterm   | 85.0  | 100.0     | 30.0       |
| Quiz 1    | 18.0  | 20.0      | 10.0       |
| Quiz 2    | 19.0  | 20.0      | 10.0       |

**Steps:** 1. Login as `inst1` 2. Navigate to “Grade Entry (Live)” 3. Select a section from dropdown 4. Select a student from list 5. Enter/modify scores in the table 6. Click “Save Grades”

**Expected Result:** - Scores saved successfully - Success message displayed - Grades persist after refresh

### Test Case I3: Add Grade Component

The screenshot shows two instances of the Instructor Portal interface. Both instances have a dark teal sidebar on the left with the following menu items:

- Instructor Dashboard
- Instructor Portal** (highlighted)
- My Sections
- Grade Entry (Live)
- Class Stats
- Export CSV
- Change Password
- Logout

The main content area displays a list of students for section A - Data Structures. Two students are selected: Roll No: 2024001 and Roll No: 2024002. A modal dialog titled "Add Component" is open, prompting for the following information:

| Component Name: | Assignment1 |
|-----------------|-------------|
| Max Score:      | 50          |
| Weight (%):     | 10          |

At the bottom of the main window are three buttons: "Add Comp...", "Delete Component", and "Save Grades".

The taskbar at the bottom of the screen shows various application icons and the system clock indicating 6:44 PM on 11/23/2025.

The second instance of the portal shows the same interface after the component has been added. A message dialog box is displayed, stating "Component added for 2 enrollments." with an "OK" button.

Instructor Dashboard

Instructor Portal

Select Section: A - Data Structures

Students:

| Roll No. | Component   | Score | Max Score | Weight (%) |
|----------|-------------|-------|-----------|------------|
| 2024001  | Assignment1 | 0.0   | 50.0      | 10.0       |
| 2024002  |             |       |           |            |

Add Comp... Delete Component Save Grades

**Steps:** 1. Login as inst1 2. Navigate to “Grade Entry (Live)” 3. Select a section 4. Click “Add Component” 5. Enter component name, max score, weight 6. Click OK

**Expected Result:** - Component added to all students in section - Component appears in grade table - Initial scores set to 0.0

## Test Case I4: View Class Stats

The screenshot shows the Instructor Portal dashboard. On the left, a sidebar menu lists "My Sections", "Grade Entry (Live)", "Class Stats", "Export CSV", "Change Password", and "Logout". The main content area displays a table titled "Statistics for: CSE101 - Introduction to Programming - A". The table has columns for "Component", "Average", "Minimum", and "Maximum". The data is as follows:

| Component | Average | Minimum | Maximum |
|-----------|---------|---------|---------|
| Final     | 87.00   | 82.00   | 92.00   |
| Midterm   | 81.50   | 78.00   | 85.00   |
| Quiz 1    | 17.50   | 17.00   | 18.00   |
| Quiz 2    | 17.50   | 16.00   | 19.00   |

**Steps:** 1. Login as inst1 2. Navigate to “Class Stats” 3. Select a section from dropdown 4. Click “Show Stats”

**Expected Result:** - Statistics displayed: Component, Avg, Min, Max - Calculations are accurate - All grade components included

## Test Case I5: Export CSV

The screenshot shows the Instructor Portal interface. On the left, a sidebar lists 'My Sections', 'Grade Entry (Live)', 'Class Stats', 'Export CSV' (which is selected), 'Change Password', and 'Logout'. The main content area displays a 'Grade summary for CSE101 - Introduction to Programming - A (Total students: 2)' table:

| Student Roll No. | Percentage | Letter Grade |
|------------------|------------|--------------|
| 2024001          | 90.00%     | A            |
| 2024002          | 80.90%     | B            |

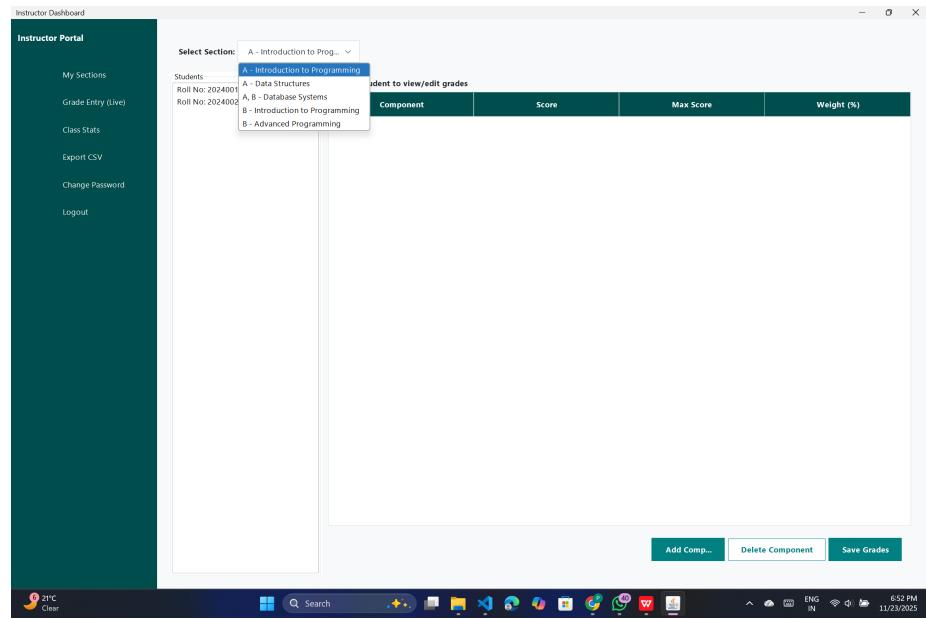
A message box in the center says 'Exported successfully to: C:\Users\zeiga\OneDrive\Desktop\grades\_summary\_CSE101.csv' with an 'OK' button. Below the table is a large Excel window showing the same data in a CSV file format:

| Student Roll No. | Percentage | Letter Grade |
|------------------|------------|--------------|
| 2024001          | 90 A       |              |
| 2024002          | 80.9 B     |              |

**Steps:** 1. Login as `inst1` 2. Navigate to “Export CSV” 3. Click “Export Grades as CSV” 4. Choose save location 5. Open CSV file

**Expected Result:** - CSV file saved successfully - Contains: Section, Student Roll No., Component, Score, Final Grade - All students’ grades included

## Test Case I6: Cannot Access Other Instructor's Section



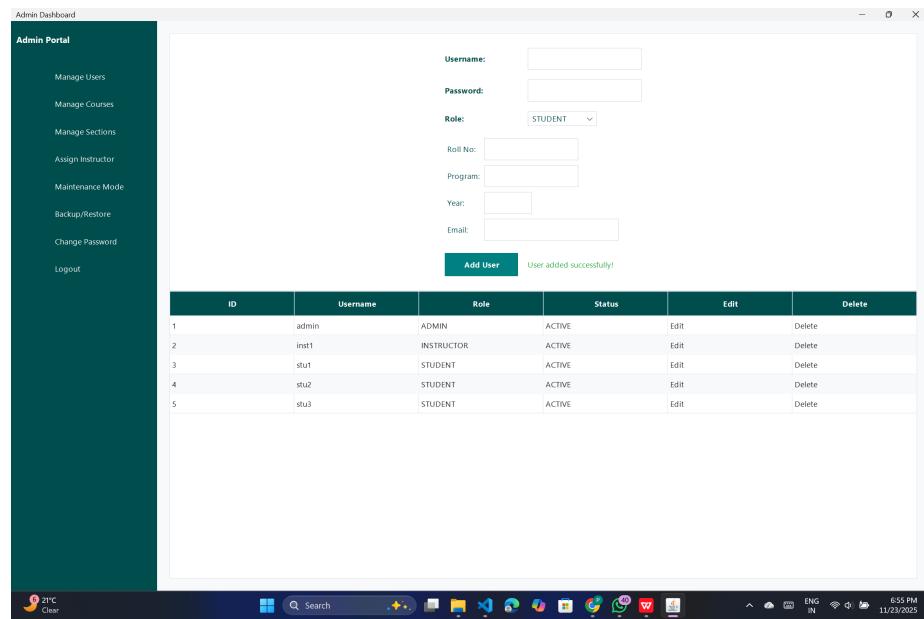
**Steps:** 1. Login as `inst1` 2. Try to access grade entry for a section not assigned to `inst1`

**Expected Result:** - Cannot see sections from other instructors - No unauthorized access possible

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## D. Admin Tests

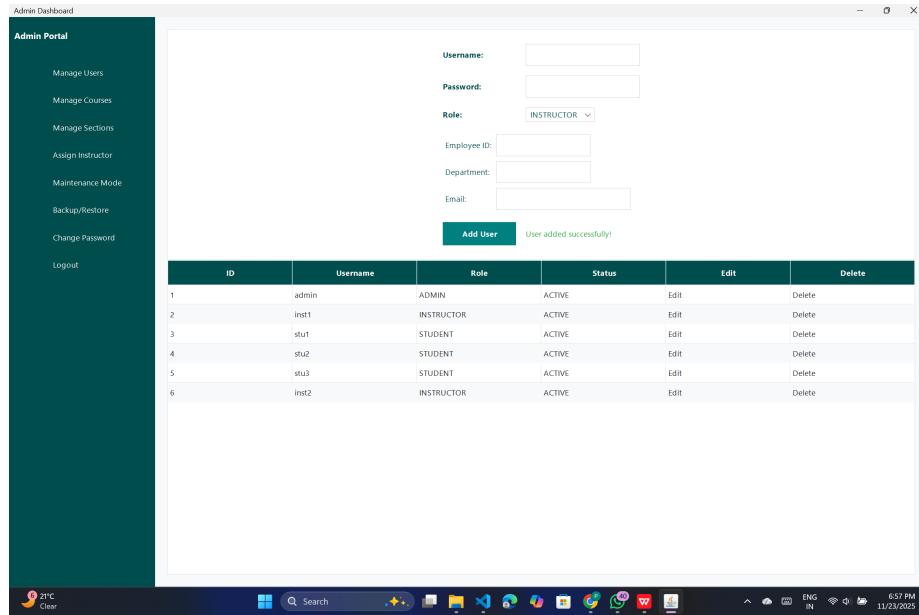
### Test Case A1: Create Student User



**Steps:** 1. Login as admin 2. Navigate to “Manage Users” 3. Enter username, password, select role “STUDENT” 4. Fill student fields: Roll No., Program, Year, Email 5. Click “Add User”

**Expected Result:** - User created successfully - Appears in users table - Can login with new credentials - Student profile created in ERP DB

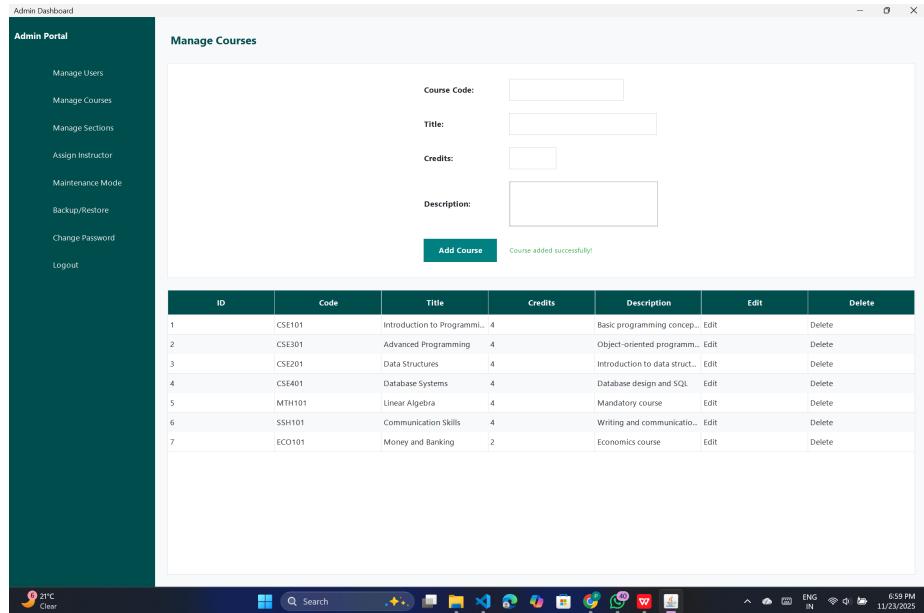
## Test Case A2: Create Instructor User



**Steps:** 1. Login as **admin** 2. Navigate to “Manage Users” 3. Enter username, password, select role “INSTRUCTOR” 4. Fill instructor fields: Employee ID, Department, Email 5. Click “Add User”

**Expected Result:** - User created successfully - Instructor profile created - Can login as instructor

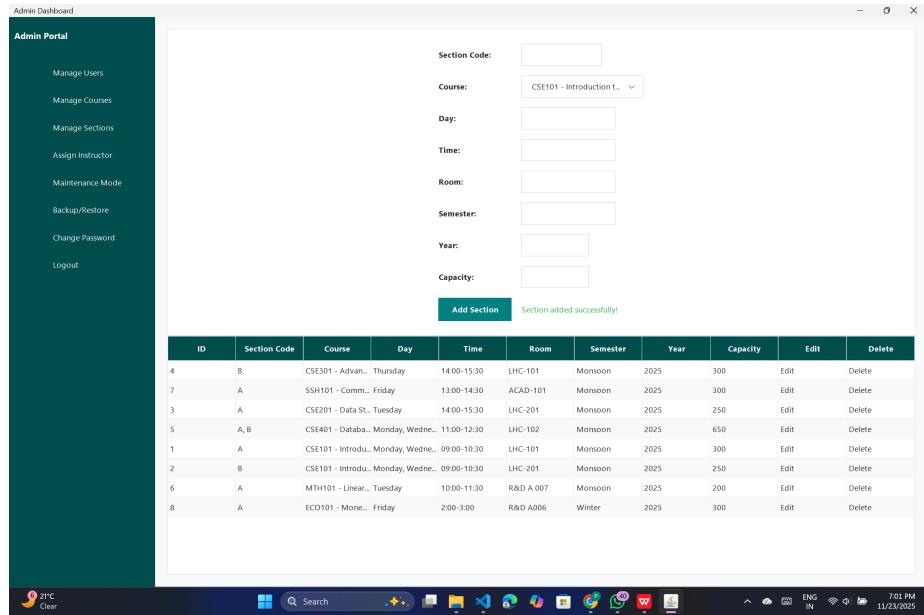
### Test Case A3: Create Course



**Steps:** 1. Login as admin 2. Navigate to “Manage Courses” 3. Enter: Code, Title, Credits, Description 4. Click “Add Course”

**Expected Result:** - Course added to table - Appears in course list - Can be selected when creating sections

### Test Case A4: Create Section



**Steps:** 1. Login as admin 2. Navigate to “Manage Sections” 3. Fill all fields: Section Code, Course, Day, Time, Room, Semester, Year, Capacity 4. Click “Add Section”

**Expected Result:** - Section created successfully - Appears in sections table - Available for student registration

## Test Case A5: Assign Instructor to Section

The screenshot shows the Admin Portal interface. On the left, a sidebar menu lists: Admin Dashboard, Manage Users, Manage Courses, Manage Sections, Assign Instructor (which is currently selected), Maintenance Mode, Backup/Restore, Change Password, and Logout. The main content area displays a table of sections:

| Section ID | Section | Course                         | Semester | Year | Instructor    | Update |
|------------|---------|--------------------------------|----------|------|---------------|--------|
| 4          | B       | CSE301 - Advanced Progra...    | Monsoon  | 2025 | INST001 (CSE) | Update |
| 7          | A       | SSH101 - Communication S...    | Monsoon  | 2025 | (none)        | Update |
| 3          | A       | CSE201 - Data Structures       | Monsoon  | 2025 | INST001 (CSE) | Update |
| 5          | A, B    | CSE401 - Database Systems      | Monsoon  | 2025 | INST001 (CSE) | Update |
| 1          | A       | CSE101 - Introduction to Pr... | Monsoon  | 2025 | INST001 (CSE) | Update |
| 2          | B       | CSE101 - Introduction to Pr... | Monsoon  | 2025 | INST001 (CSE) | Update |
| 6          | A       | MTH101 - Linear Algebra        | Monsoon  | 2025 | (none)        | Update |
| 8          | A       | ECO101 - Money and Banki...    | Winter   | 2025 | (none)        | Update |

An 'Assign Instructor' dialog box is overlaid on the table, containing a dropdown menu with 'INST002 (MTH)' and two buttons: 'OK' and 'Cancel'. The system status bar at the bottom right shows '7:02 PM 11/23/2025'.

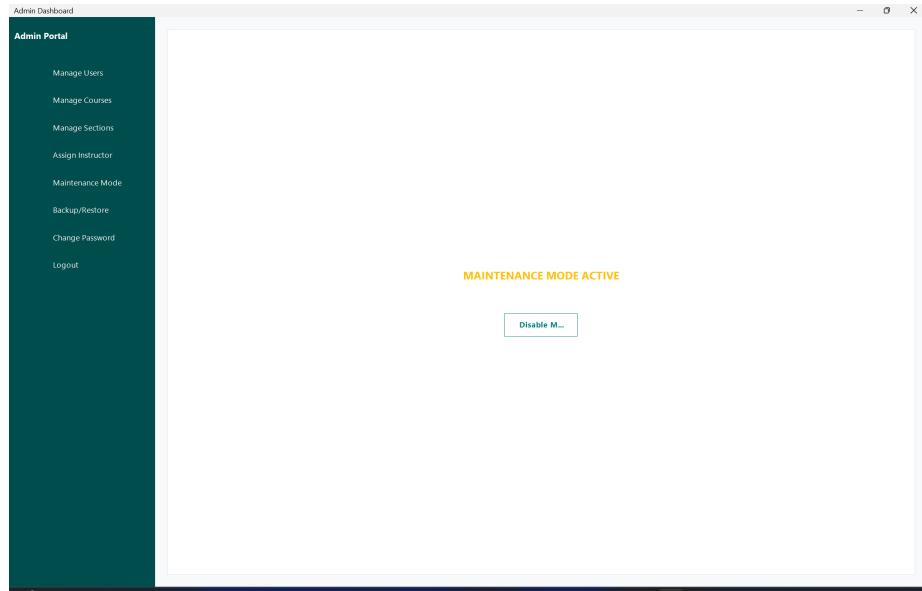
  

The second screenshot shows the same Admin Portal interface, but the table has been updated. The section with Section ID 6 now has 'INST002 (MTH)' assigned as the instructor. The system status bar at the bottom right shows '7:02 PM 11/23/2025'.

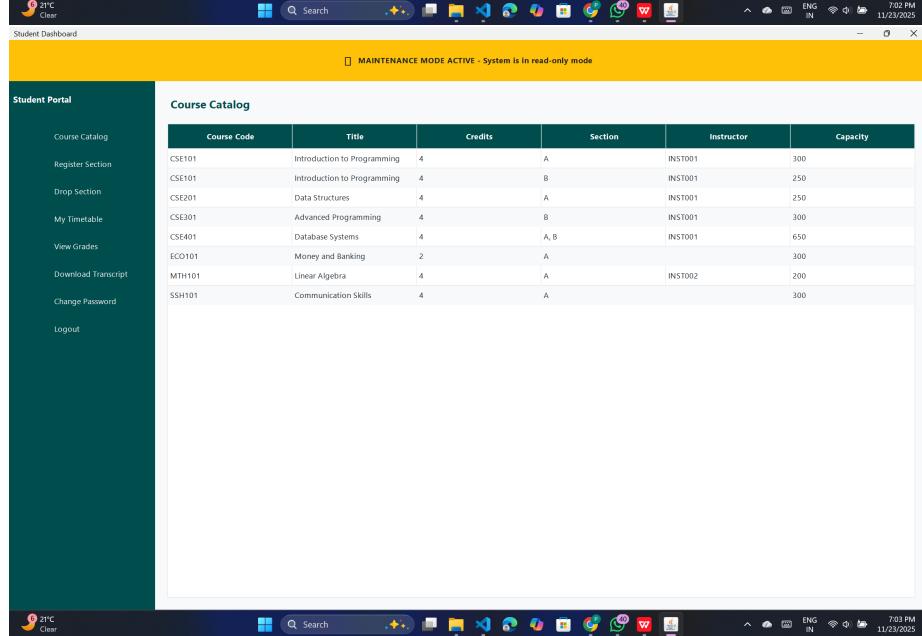
**Steps:** 1. Login as **admin** 2. Navigate to “Assign Instructor” 3. Click “Update” button for a section 4. Select an instructor from dropdown 5. Click OK

**Expected Result:** - Instructor assigned successfully - Section shows updated instructor - Instructor can see section in their dashboard

## Test Case A6: Toggle Maintenance Mode ON



The screenshot shows the Admin Portal interface. On the left, a dark sidebar menu lists: Admin Dashboard, Admin Portal (selected), Manage Users, Manage Courses, Manage Sections, Assign Instructor, Maintenance Mode (selected), Backup/Restore, Change Password, and Logout. The main content area displays a yellow banner at the top with the text "MAINTENANCE MODE ACTIVE". Below the banner is a button labeled "Disable M...".

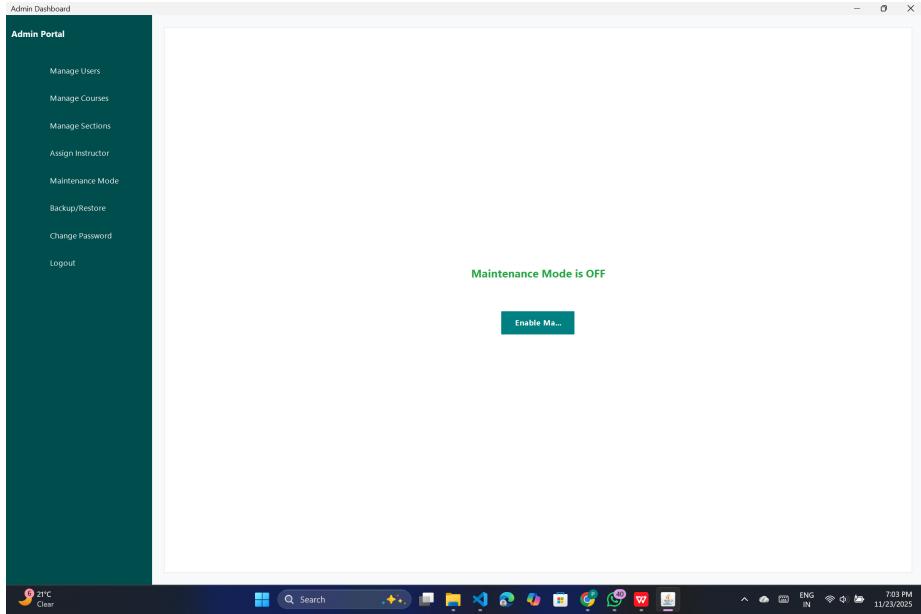
The screenshot shows the Student Portal interface. On the left, a dark sidebar menu lists: Student Dashboard (selected), Student Portal, Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The main content area displays a yellow banner at the top with the text "MAINTENANCE MODE ACTIVE - System is in read-only mode". Below the banner is a table titled "Course Catalog" showing course details:

| Course Code | Title                       | Credits | Section | Instructor | Capacity |
|-------------|-----------------------------|---------|---------|------------|----------|
| CSE101      | Introduction to Programming | 4       | A       | INST001    | 300      |
| CSE101      | Introduction to Programming | 4       | B       | INST001    | 250      |
| CSE201      | Data Structures             | 4       | A       | INST001    | 250      |
| CSE301      | Advanced Programming        | 4       | B       | INST001    | 300      |
| CSE401      | Database Systems            | 4       | A,B     | INST001    | 650      |
| ECO101      | Money and Banking           | 2       | A       |            | 300      |
| MTH101      | Linear Algebra              | 4       | A       | INST002    | 200      |
| SSH101      | Communication Skills        | 4       | A       |            | 300      |

**Steps:** 1. Login as admin 2. Navigate to “Maintenance Mode” 3. Click “Enable Maintenance Mode”

**Expected Result:** - Status shows “MAINTENANCE MODE ACTIVE” - Banner appears on student/instructor dashboards - Student/instructor cannot make changes (test register/drop blocked) - View-only access for students/instructors

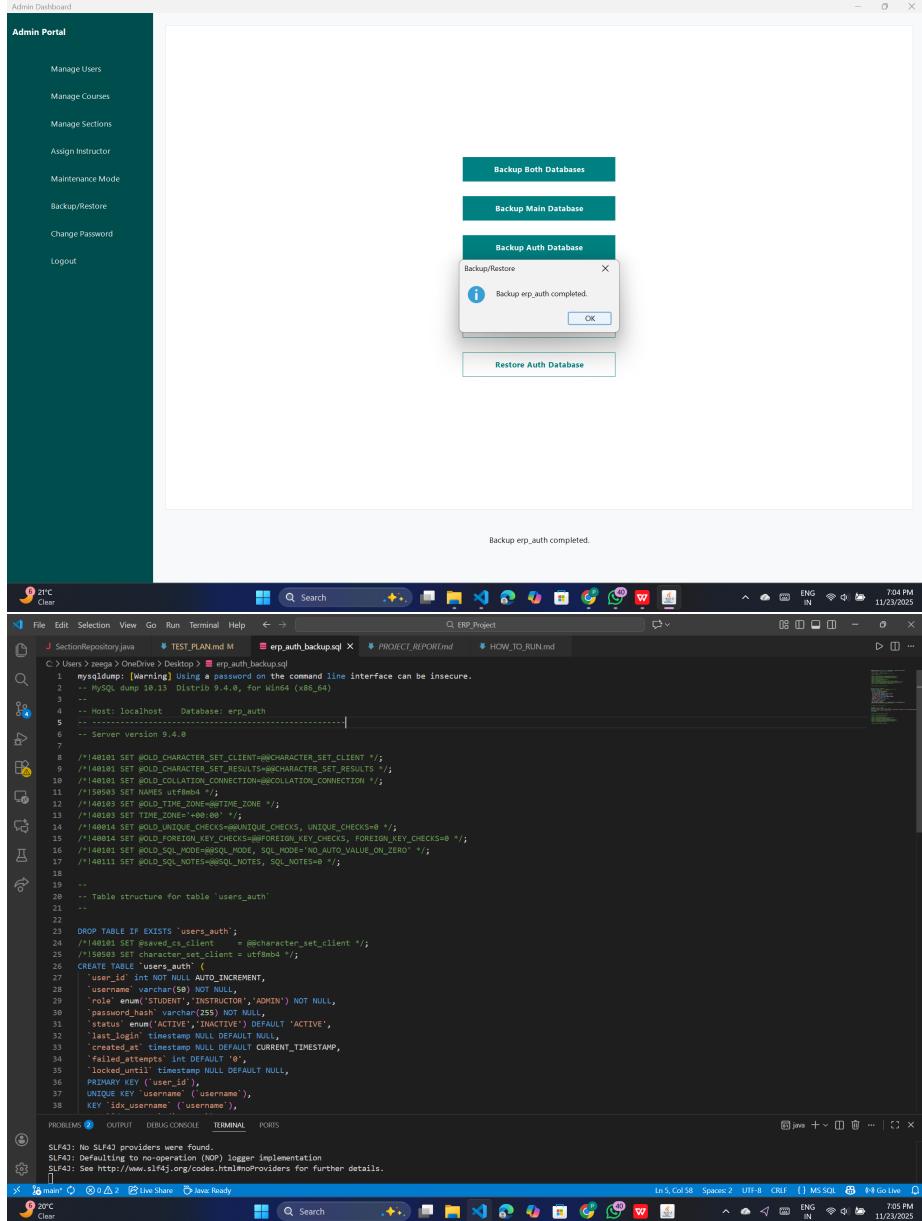
### Test Case A7: Toggle Maintenance Mode OFF



**Steps:** 1. With maintenance ON, click “Disable Maintenance Mode”

**Expected Result:** - Status shows “Maintenance Mode is OFF” - Banner disappears - Normal functionality restored - Students/instructors can make changes again

## Test Case A8: Backup Database

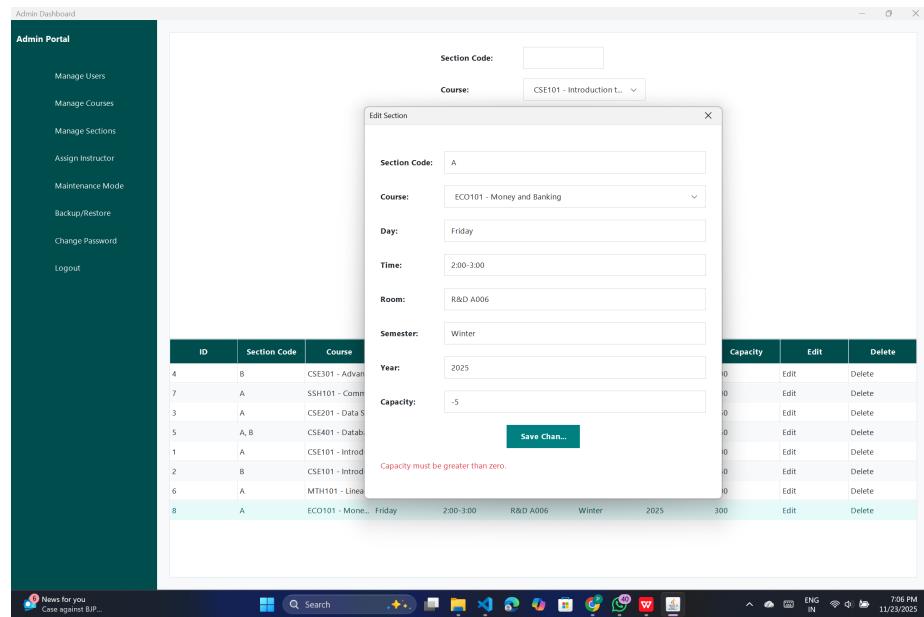


**Steps:** 1. Login as **admin** 2. Navigate to “Backup/Restore” 3. Click “Backup ERP Databases” 4. Choose save location

**Expected Result:** - Backup file created successfully - SQL dump file is valid - Success message displayed

## E. Edge & Negative Tests

### Test Case E1: Negative Capacity



**Steps:** 1. Login as admin 2. Try to create section with capacity = -5

**Expected Result:** - Error message displayed - Section not created - Validation prevents invalid data

## Test Case E2: Empty Required Fields

The screenshot shows the Admin Portal interface. On the left, a dark sidebar lists navigation options: Admin Dashboard, Admin Portal, Manage Users, Manage Courses, Manage Sections, Assign Instructor, Drop Deadline, Maintenance Mode, Backup/Restore, Change Password, and Logout. The main content area displays a table of users with columns: ID, Username, Role, Status, Edit, and Delete. The table contains 6 rows of data. A modal window titled 'Add User' is open in the center. It contains fields for Username, Password, Role (set to STUDENT), Roll No. (2024004), Program (CSB), Year (2), and Email (inst4@iitd.ac.in). Below the form is a red error message: 'Username and password required.' At the bottom of the modal is a 'Add User' button.

| ID | Username | Role       | Status | Edit | Delete |
|----|----------|------------|--------|------|--------|
| 1  | admin    | ADMIN      | ACTIVE | Edit | Delete |
| 2  | inst1    | INSTRUCTOR | ACTIVE | Edit | Delete |
| 3  | stu1     | STUDENT    | ACTIVE | Edit | Delete |
| 4  | stu2     | STUDENT    | ACTIVE | Edit | Delete |
| 5  | stu3     | STUDENT    | ACTIVE | Edit | Delete |
| 6  | inst2    | INSTRUCTOR | ACTIVE | Edit | Delete |

**Steps:** 1. Try to create course without title 2. Try to create user without username and password

**Expected Result:** - Error messages for missing required fields - Operation blocked until fields filled

### Test Case E3: Duplicate Enrollment Prevention

The screenshot shows a Windows desktop environment with a student portal application open. The application has a dark teal sidebar on the left with various navigation links: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The main content area displays a table of courses with columns: Section Code, Course, Instructor, Available Seats, and Enroll. A modal dialog titled "Registration Results" is displayed, showing an error message: "Registration failed: B (Introduction to Programming): Already enrolled in another section of this course".

| Section Code | Course                      | Instructor | Available Seats | Enroll                              |
|--------------|-----------------------------|------------|-----------------|-------------------------------------|
| B            | Advanced Programming        | inst1      | 299             | <input type="checkbox"/>            |
| A            | Communication Skills        |            | 300             | <input type="checkbox"/>            |
| A            | Data Structures             | inst1      | 249             | <input type="checkbox"/>            |
| A, B         | Database Systems            | inst1      | 650             | <input type="checkbox"/>            |
| A            | Introduction to Programming | inst1      | 298             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 250             | <input checked="" type="checkbox"/> |
| A            | Linear Algebra              | inst2      | 200             | <input type="checkbox"/>            |
| A            | Money and Banking           |            | 300             | <input type="checkbox"/>            |

**Steps:** 1. Login as stu1 2. Register for a section 3. Try to register for another section of the same course

**Expected Result:** - Error: “Already enrolled in another section of this course”

## Test Case E4: Student Cannot Access Another Student's Data

The screenshot shows a Windows desktop environment with a student portal window open. The window title is "Student Dashboard" and the main header is "Student Portal". On the left, there is a sidebar with the following menu items: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout. The main content area displays a table titled "Introduction to Programming (Section A)". At the top right of this table, it says "Final Grade: 90.00% (A)". The table has columns for Component, Score, Max Score, Weight (%), and Percentage. The data in the table is as follows:

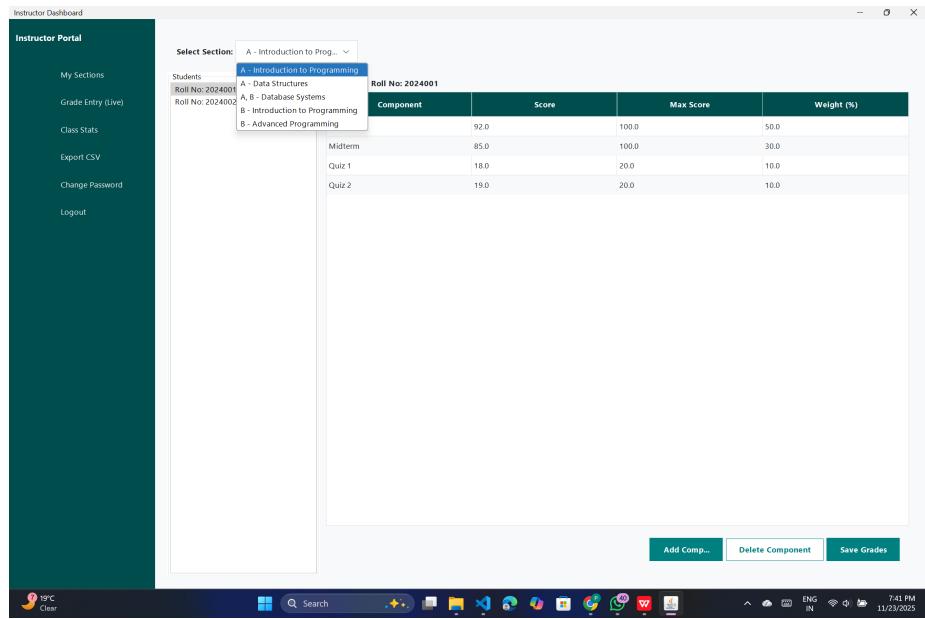
| Component | Score | Max Score | Weight (%) | Percentage |
|-----------|-------|-----------|------------|------------|
| Final     | 92.0  | 100.0     | 50.0       | 92.00%     |
| Midterm   | 85.0  | 100.0     | 30.0       | 85.00%     |
| Quiz 1    | 18.0  | 20.0      | 10.0       | 90.00%     |
| Quiz 2    | 19.0  | 20.0      | 10.0       | 95.00%     |

The system status bar at the bottom shows the date as 11/23/2025 and the time as 7:40 PM.

**Steps:** 1. Login as `stu1` 2. Check “View Grades” - should only see own grades  
3. Check “Timetable” - should only see own enrollments

**Expected Result:** - Only `stu1`'s data visible - No access to `stu2`'s data -  
Queries filtered by `student_id`

## Test Case E5: Instructor Cannot Grade Other Sections



The screenshot shows the Instructor Portal dashboard. On the left, a sidebar lists 'My Sections', 'Grade Entry (Live)', 'Class Stats', 'Export CSV', 'Change Password', and 'Logout'. The main area is titled 'Instructor Portal' and contains a 'Select Section' dropdown set to 'A - Introduction to Programming'. Below it, a table shows student information: Roll No: 2024001 and Roll No: 2024002. The table lists components: Midterm, Quiz 1, and Quiz 2, with scores and max scores. At the bottom are buttons for 'Add Comp...', 'Delete Component', and 'Save Grades'.

| Component | Score | Max Score | Weight (%) |
|-----------|-------|-----------|------------|
| Midterm   | 85.0  | 100.0     | 30.0       |
| Quiz 1    | 18.0  | 20.0      | 10.0       |
| Quiz 2    | 19.0  | 20.0      | 10.0       |

**Steps:** 1. Login as `inst1` 2. Navigate to “Grade Entry” 3. Check section dropdown - should only show own sections

**Expected Result:** - Only `inst1`'s sections available - Cannot access other instructors' sections

## Test Case E6: Maintenance Mode Blocks All Writes

The screenshot shows a student dashboard with a yellow header bar indicating "MAINTENANCE MODE ACTIVE - System is in read-only mode". The main content area displays a table of courses with columns for Section Code, Course, Instructor, Available Seats, and Enroll. A modal window titled "Registration Results" shows a warning message: "⚠️ Maintenance mode is active. Registration is disabled." with an "OK" button. The left sidebar lists navigation options: Course Catalog, Register Section, Drop Section, My Timetable, View Grades, Download Transcript, Change Password, and Logout.

| Section Code | Course                      | Instructor | Available Seats | Enroll                              |
|--------------|-----------------------------|------------|-----------------|-------------------------------------|
| B            | Advanced Programming        | inst1      | 299             | <input type="checkbox"/>            |
| A            | Communication Skills        |            | 300             | <input type="checkbox"/>            |
| A            | Data Structures             | inst1      | 249             | <input type="checkbox"/>            |
| A, B         | Database Systems            | inst1      | 650             | <input type="checkbox"/>            |
| A            | Introduction to Programming | inst1      | 298             | <input type="checkbox"/>            |
| B            | Introduction to Programming | inst1      | 250             | <input type="checkbox"/>            |
| A            | Linear Algebra              | inst2      | 200             | <input type="checkbox"/>            |
| A            | Money and Banking           |            | 300             | <input checked="" type="checkbox"/> |

**Steps:** 1. Admin enables maintenance mode 2. As student: Try to register 3. As student: Try to drop 4. As instructor: Try to save grades 5. As instructor: Try to add component

**Expected Result:** - All write operations blocked with message - Clear message: “Maintenance mode is active” - Only read/view operations allowed

## F. Data Integrity Tests

### Test Case F1: Cascade Behaviour

The screenshot shows the Admin Portal interface. On the left, there is a sidebar with the following menu items:

- Manage Users
- Manage Courses
- Manage Sections
- Assign Instructor
- Drop Deadline
- Maintenance Mode
- Backup/Restore
- Change Password
- Logout

The main window is titled "Admin Dashboard" and contains a form for adding a section. The fields are:

|               |                          |
|---------------|--------------------------|
| Section Code: | <input type="text"/>     |
| Course:       | CSE101 - Introduction... |
| Day:          | <input type="text"/>     |
| Time:         | <input type="text"/>     |
| Room:         | <input type="text"/>     |
| Semester:     | <input type="text"/>     |
| Year:         | <input type="text"/>     |
| Capacity:     | <input type="text"/>     |

Below the form is a button labeled "Add Section". Underneath is a table listing existing sections:

| ID | Section Code | Course              | Day              | Time        | Room      | Semester | Year | Capacity | Edit | Delete |
|----|--------------|---------------------|------------------|-------------|-----------|----------|------|----------|------|--------|
| 4  | B            | CSE301 - Advan...   | Thursday         | 14:00-15:30 | LHC-101   | Monsoon  | 2025 | 300      | Edit | Delete |
| 7  | A            | SSH101 - Comm...    | Friday           | 13:00-14:30 | ACAD-101  | Monsoon  | 2025 | 300      | Edit | Delete |
| 3  | A            | CSE201 - Data St... | Tuesday          | 14:00-15:30 | LHC-201   | Monsoon  | 2025 | 250      | Edit | Delete |
| 5  | A, B         | CSE401 - Databa...  | Monday, Wedne... | 11:00-12:30 | LHC-102   | Monsoon  | 2025 | 650      | Edit | Delete |
| 1  | A            | CSE101 - Introdu... | Monday, Wedne... | 09:00-10:30 | LHC-101   | Monsoon  | 2025 | 300      | Edit | Delete |
| 2  | B            | CSE101 - Introdu... | Monday, Wedne... | 09:00-10:30 | LHC-201   | Monsoon  | 2025 | 250      | Edit | Delete |
| 6  | A            | MTH101 - Linear...  | Tuesday          | 10:00-11:30 | R&D A 007 | Monsoon  | 2025 | 200      | Edit | Delete |

**Steps:** 1. Try to delete a course that has sections 2. Try to delete a student that has enrollments

**Expected Result:** - cascade behavior

## Test Case F2: Unique Constraints

The screenshot shows the Admin Portal interface. On the left, a dark sidebar lists navigation options: Admin Dashboard, Admin Portal, Manage Users, Manage Courses, Manage Sections, Assign Instructor, Drop Deadline, Maintenance Mode, Backup/Restore, Change Password, and Logout.

The main window displays a user creation form with fields for Username (stu3), Password (\*\*\*\*\*), Role (STUDENT), Roll No. (2024004), Program (CSB), Year (2), and Email (stu4@iitd.ac.in). A button labeled "Add User" is present. Below the form is a table listing users:

| ID | Username | Role       | Status | Edit | Delete |
|----|----------|------------|--------|------|--------|
| 1  | admin    | ADMIN      | ACTIVE | Edit | Delete |
| 2  | inst1    | INSTRUCTOR | ACTIVE | Edit | Delete |
| 3  | stu1     | STUDENT    | ACTIVE | Edit | Delete |
| 4  | stu2     | STUDENT    | ACTIVE | Edit | Delete |
| 5  | stu3     | STUDENT    | ACTIVE | Edit | Delete |
| 6  | inst2    | INSTRUCTOR | ACTIVE | Edit | Delete |

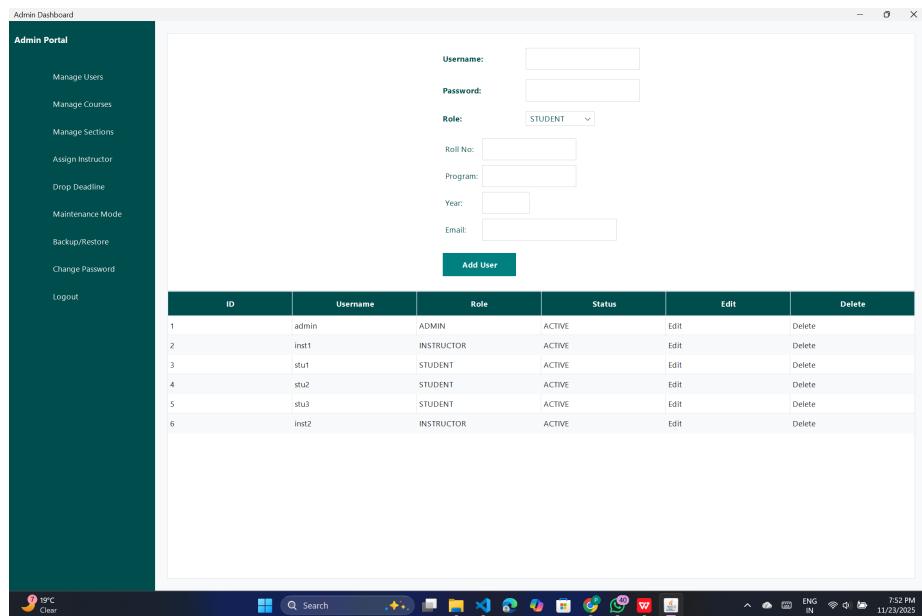
A red error message at the bottom of the table area states: "Error adding user: Duplicate entry 'stu3' for key 'users\_auth.username'".

**Steps:** 1. Try to create duplicate username 2. Try to create duplicate section code (same course, semester, year)

**Expected Result:** - Database prevents duplicates - Error message displayed

## G. UI/UX Tests

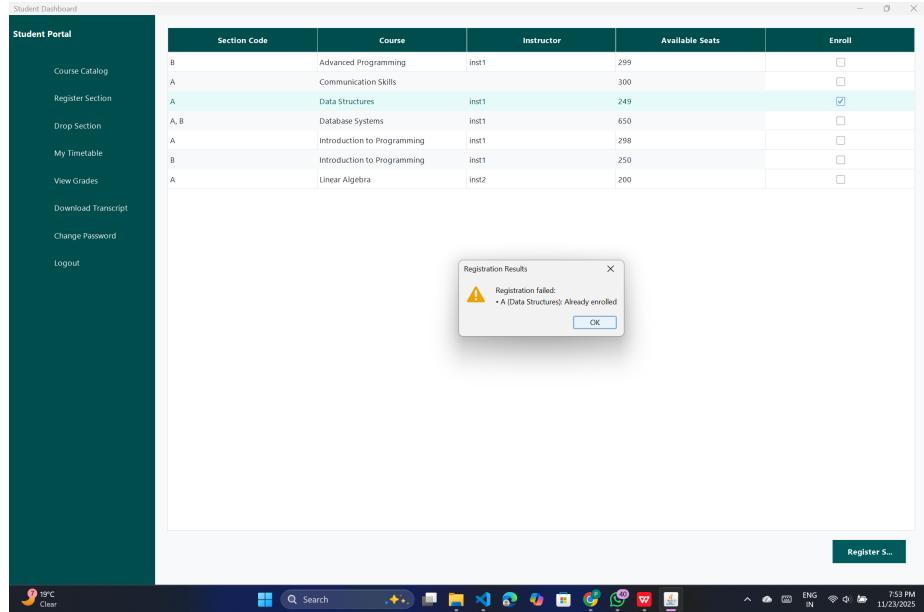
### Test Case G1: Clear Buttons and Labels



**Steps:** 1. Navigate through all panels 2. Check button labels and field labels

**Expected Result:** - All buttons clearly labeled - All fields have descriptive labels - No confusing terminology

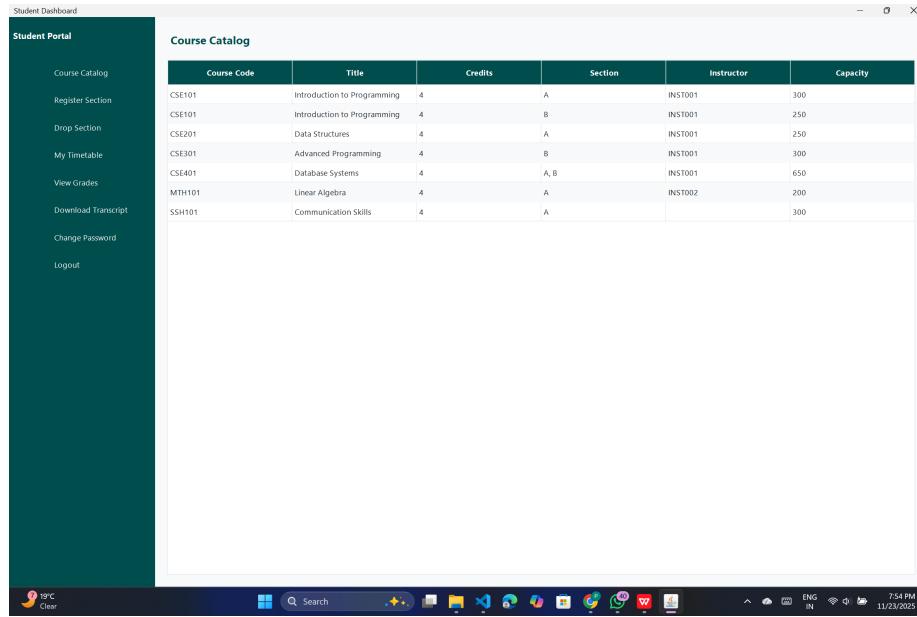
## Test Case G2: Friendly Error Messages



**Steps:** 1. Trigger various errors (wrong password, full section, etc.)

**Expected Result:** - Error messages are clear and helpful - Messages explain what went wrong - No technical jargon in user-facing messages

### Test Case G3: Tables for Lists



The screenshot shows a Windows desktop environment with a student portal application open. The application has a dark teal sidebar on the left containing links like 'Course Catalog', 'Register Section', 'Drop Section', etc. The main area is titled 'Course Catalog' and displays a table with the following data:

| Course Code | Title                       | Credits | Section | Instructor | Capacity |
|-------------|-----------------------------|---------|---------|------------|----------|
| CSE101      | Introduction to Programming | 4       | A       | INST001    | 300      |
| CSE101      | Introduction to Programming | 4       | B       | INST001    | 250      |
| CSE201      | Data Structures             | 4       | A       | INST001    | 250      |
| CSE301      | Advanced Programming        | 4       | B       | INST001    | 300      |
| CSE401      | Database Systems            | 4       | A, B    | INST001    | 650      |
| MTH101      | Linear Algebra              | 4       | A       | INST002    | 200      |
| SSH101      | Communication Skills        | 4       | A       |            | 300      |

**Steps:** 1. Check course catalog, user list, section list

**Expected Result:** - Data displayed in tables - Easy to read and navigate

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## H. Performance Tests

### Test Case P1: Catalog Loads Quickly

**Steps:** 1. Login as student 2. Navigate to “Course Catalog” 3. Measure load time

**Expected Result:** - Catalog loads in < 3 seconds - No freezing or hanging

### Test Case P2: Application Starts Without Hangs

**Steps:** 1. Launch application 2. Observe startup time

**Expected Result:** - Application starts quickly - No long pauses or crashes - Login screen appears promptly

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## I. Security Tests

### Test Case SEC1: Password Hashing

The screenshot shows the MySQL Workbench interface with the following details:

- SQL Editor:** Displays the SQL command: `USE erp_auth;` and `SELECT * FROM users_auth;`
- Result Grid:** Shows a table named `users_auth` with the following data:

| user_id | username | role       | password_hash                               | status | last_login          | created_at          | failed_attempts | locked_until        |
|---------|----------|------------|---------------------------------------------|--------|---------------------|---------------------|-----------------|---------------------|
| 1       | admin    | ADMIN      | \$2a\$10\$bd/dM5GurjBq5OzJmg.enVhL2mH...    | ACTIVE | 2025-11-23 17:44:50 | 2025-11-23 17:44:50 | 0               | 2025-11-23 17:44:50 |
| 2       | rest1    | INSTRUCTOR | \$2a\$10\$bd/dM5GurjBq5OzJmg.enVhL2mH...    | ACTIVE | 2025-11-23 17:44:50 | 2025-11-23 17:44:50 | 0               | 2025-11-23 17:44:50 |
| 3       | stu1     | STUDENT    | \$2a\$10\$ACTCZx8ETkX9RphM4kAONnfQg...      | ACTIVE | 2025-11-23 17:44:50 | 2025-11-23 17:44:50 | 0               | 2025-11-23 17:44:50 |
| 4       | stu2     | STUDENT    | \$2a\$10\$ygtTf500nWv1oegvNMsE5ELUpPwvQR... | ACTIVE | 2025-11-23 17:44:50 | 2025-11-23 17:44:50 | 0               | 2025-11-23 17:44:50 |
| 5       | stu3     | STUDENT    | \$2a\$10\$ygtTf500nWv1oegvNMsE5ELUpPwvQR... | ACTIVE | 2025-11-23 18:55:57 | 2025-11-23 18:55:57 | 0               | 2025-11-23 18:55:57 |
| 6       | rest2    | INSTRUCTOR | \$2a\$10\$90e+4QW.b1t0legvNMsE5ELUpPwvQR... | ACTIVE | 2025-11-23 18:57:51 | 2025-11-23 18:57:51 | 0               | 2025-11-23 18:57:51 |

- Output:** Shows the execution history with two entries:
  - 1 19:56:47 USE erp\_auth
  - 2 19:56:47 SELECT \* FROM users\_auth LIMIT 0, 1000Both entries show 0 rows affected and 0 rows returned.

**Steps:** 1. Check database: `USE erp_auth;` `SELECT * FROM users_auth;`

**Expected Result:** - Passwords stored as bcrypt hashes (starting with 2a) - No plaintext passwords in database

## Test Case SEC2: Two-Database Separation

The screenshot shows the MySQL Workbench interface with the following details:

- Schemas:** erp\_auth, erp\_main, sys.
- Current Schema:** erp\_main
- Query Editor:** Contains 8 SELECT statements from the erp\_main database.
- Result Grid:** Shows data for sections, courses, and sections.
- Output:** Displays the execution history of the queries, including time, message, rows affected, and duration.

**Steps:** 1. Verify passwords only in `erp_auth` database 2. Verify student/instructor data only in `erp_main` database

**Expected Result:** - Clear separation maintained - No password data in `erp_main` - User\_id links both databases

## Test Summary Template

After running tests, fill this out:

| Test Category       | Total Tests | Passed | Failed |
|---------------------|-------------|--------|--------|
| Login & Roles       | 5           | 5      | 0      |
| Student Features    | 9           | 9      | 0      |
| Instructor Features | 6           | 6      | 0      |
| Admin Features      | 8           | 8      | 0      |
| Edge Cases          | 6           | 6      | 0      |
| Data Integrity      | 2           | 2      | 0      |
| UI/UX               | 3           | 3      | 0      |
| Performance         | 2           | 2      | 0      |
| Security            | 2           | 2      | 0      |
| <b>Total</b>        | <b>43</b>   |        | 0      |

**Test Environment:** - Java Version: 17 - MySQL Version: 8.0.33 - OS: Windows

- Test Date: 24-November-2025