# Testing

## Introduction

Testing is a critical phase in the software development lifecycle that ensures the system meets its intended requirements and functions correctly under various conditions. For UTMS, testing focused on verifying both the student and admin interfaces, database operations, and API endpoints. Functional testing, unit testing, and integration testing were performed using manual and automated tools to validate system reliability and user experience.

## Testing Types and Methods

* 1. **Unit Testing**

Each module (e.g., login, challan upload, registration) was tested independently to ensure it worked as expected. Unit tests were written using basic function simulations and tested via browser DevTools and Postman for backend APIs.

* 1. **Integration Testing**

Integration testing was conducted to verify that multiple components—like frontend forms and backend APIs—interacted correctly. For example, the challan submission module was tested from student UI to database storage.

* 1. **Functional Testing**

The system was tested for all defined use cases such as student registration, admin login, challan verification, route updates, and notifications.

* 1. **User Acceptance Testing (UAT)**

UAT was conducted with mock student accounts and dummy challan data to simulate real-world usage. Admins also performed testing from their respective dashboards.

## Test Cases Overview

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| --- | --- | --- | --- | --- |
| Test Case ID | Feature | Description | Expected Result | Status |
| TC-001 | Student Login | Valid credentials input | Redirect to homepage | Pass |
| TC-002 | Student Login | Invalid credentials | Error: "Invalid username or password" | Pass |
| TC-003 | Registration | Valid signup request | Confirmation email sent | Pass |
| TC-004 | Registration | Incomplete or invalid data | Rejected with error | Pass |
| TC-005 | Challan Generation | Challan creation and download in PDF | File successfully downloaded | Pass |
| TC-006 | Challan Verification | Admin verifies submitted challan | Status changes to "Approved" | Pass |
| TC-007 | Notifications | Admin sends a message | Student receives email & in-app alert | Pass |
| TC-008 | Schedule Update | Admin updates transport schedule | Student dashboard reflects changes | Pass |
| TC-009 | Profile Management | Student updates profile photo/details | Changes saved and viewable | Pass |

## Testing Tools Used

* Postman – For API testing (CRUD operations and authentication)
* MongoDB Compass – For verifying database records
* Browser DevTools – For frontend behavior testing and form validation
* Console Logs – For debugging issues and flow tracking
* Visual Studio Code Debugger – For backend logic validation

## Bug Tracking and Fixes

Bugs were tracked manually using a shared document, and each was resolved before final deployment. Common issues included:

* Unhandled empty form submissions – Fixed with frontend validations.
* Incorrect challan file formats – Implemented file type restrictions.
* Routes scheduling conflicts – Resolved through time-slot checks.

## Final Testing Outcome

After comprehensive testing of all modules, the UTMS system was marked as stable for deployment. All major features passed their respective test cases, and no critical issues remained.  
  
UTMS has successfully passed the functional, integration, and user acceptance tests and is ready for real-world use within the university environment.