**Software Test Plan (STP) - Student Attendance Management System (SAMS)**

**Project:** Student Attendance Management System  
**Version:** 1.0  
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**Status:** Draft

**1. Introduction**

**Purpose:**  
This document defines the test plan for the Student Attendance Management System v1.0. It outlines the testing objectives, scope, approach, resources, schedule, and responsibilities to ensure the system meets functional, performance, security, and compliance standards including FERPA requirements.

**Scope:**  
Testing covers key features including user authentication (student/teacher/admin/parent login), attendance marking via multiple methods (manual, QR code, proximity card), attendance reporting, notifications (alerts for absences), administrative functions, parent portal access, mobile application functionality, and integration with external systems (LDAP, email, SMS gateways). Hardware devices outside the application scope and grading modules are excluded.

**References:**

* SAMS SRS v1.0
* SAMS Design Specifications v1.0
* FERPA Compliance Guidelines
* WCAG 2.1 AA Accessibility Standards
* Institutional Policies on Attendance

**Definitions:**

* SAMS — Student Attendance Management System
* SRS — Software Requirements Specification
* RTM — Requirements Traceability Matrix
* FERPA — Family Educational Rights and Privacy Act
* WCAG — Web Content Accessibility Guidelines

**2. Test Items**

* Authentication module (students, teachers, admins, parents)
* Attendance marking module (manual, QR code, proximity card)
* Attendance reports module (daily, monthly, custom)
* Notification module (emails, SMS alerts)
* Admin interface (manage classes, users, schedules)
* Parent portal (view child's attendance, configure preferences)
* Mobile application (iOS/Android attendance marking)
* Integration modules (LDAP, SMTP, SMS gateway)
* Database backup and recovery processes

**3. Features to be Tested**

|  |  |
| --- | --- |
| **Req ID** | **Feature Description** |
| SAMS-F-001 | User authentication via username/password, LDAP, or SSO |
| SAMS-F-002 | Role-based access control with distinct permissions |
| SAMS-F-010 | Student CRUD operations by administrators |
| SAMS-F-011 | Bulk student import via CSV file upload |
| SAMS-F-012 | Student enrollment history maintenance |
| SAMS-F-020 | Manual attendance marking by faculty |
| SAMS-F-021 | QR code-based attendance marking by students |
| SAMS-F-022 | Attendance timing validation against class schedules |
| SAMS-F-023 | Attendance record modification with audit trail |
| SAMS-F-024 | Proximity card-based attendance marking |
| SAMS-F-030 | Automated email notifications to parents |
| SAMS-F-031 | SMS alerts for critical attendance issues |
| SAMS-F-032 | User notification preference configuration |
| SAMS-F-040 | Attendance report generation by student, class, time period |
| SAMS-F-041 | Report export in CSV, Excel, and PDF formats |
| SAMS-F-042 | Attendance analytics dashboard with charts |
| SAMS-F-043 | Attendance percentage calculation with policy compliance |
| SAMS-NF-001 | System support for up to 10,000 concurrent users with ≤3s response |
| SAMS-NF-002 | 99.5% uptime during academic hours (8 AM - 6 PM) |
| SAMS-NF-003 | FERPA compliance for student data privacy |
| SAMS-NF-004 | Daily data backup with 4-hour restore capability |
| SAMS-NF-005 | Responsive web interface and WCAG 2.1 AA compliance |
| SAMS-SR-001 | HTTPS encryption (TLS 1.2+) for all data transmission |
| SAMS-SR-002 | Password complexity requirements and bcrypt hashing |
| SAMS-SR-003 | Comprehensive audit logging with timestamps |
| SAMS-SR-004 | Encrypted database connections with credential rotation |
| SAMS-SR-005 | Input validation to prevent SQL injection and XSS attacks |

**4. Features Not to be Tested**

* Biometric device integrations (future phase)
* Grade management and curriculum features
* Network infrastructure outside application control
* Third-party hardware maintenance

**5. Test Approach / Strategy**

**Levels:**

* Unit testing (individual modules)
* Integration testing (module interactions and external systems)
* System testing (end-to-end workflows)
* User Acceptance Testing (UAT) with educators, administrators, and parents

**Types:**

* Functional Testing (core features including attendance marking & reports)
* Regression Testing (after bug fixes and feature additions)
* Performance Testing (response times, load handling, concurrent users)
* Usability Testing (interface clarity, accessibility compliance)
* Security Testing (session management, input validation, role-based access)
* Mobile Testing (iOS/Android app functionality)
* Integration Testing (LDAP, email, SMS gateway connectivity)
* Accessibility Testing (WCAG 2.1 AA compliance)
* Compliance Testing (FERPA requirements)

**Entry Criteria:**

* Stable software build with core functionality implemented
* Test environment configured with external system integrations
* Test data (users, classes, schedules) prepared including parent accounts
* Mobile app builds available for testing

**Exit Criteria:**

* All critical and high priority test cases executed and passed
* No critical defects remain unresolved
* FERPA compliance verification completed
* Accessibility audit passed
* Performance benchmarks met under load testing
* Acceptance criteria approved by product owner

**5.1 Security & Compliance Validation**

**Security Testing:**

* Secure password storage (hashed & salted passwords using bcrypt)
* Session timeout implementation tested (30 minutes inactivity)
* Role-based access control enforcement
* Input validation to prevent SQL injection, XSS attacks
* HTTPS enforcement for all communications
* API authentication and rate limiting
* Penetration testing on authentication and notification workflows

**FERPA Compliance Testing:**

* Student data access restrictions by role
* Parent access limited to their own child's data only
* Audit trail for all student data access and modifications
* Data retention and deletion policies enforcement
* Consent management for data sharing
* Secure data transmission and storage verification

**6. Test Environment**

**Hardware:**

* Client devices (PCs, tablets, smartphones - iOS/Android)
* Server environment (cloud-hosted with load balancers)
* Network infrastructure supporting HTTPS and high availability

**Software:**

* SAMS web application v1.0
* SAMS mobile applications (iOS/Android)
* Database server MySQL/PostgreSQL
* LDAP server for authentication testing
* Email server (SMTP) for notification testing
* SMS gateway service for text alerts

**Tools:**

* Selenium WebDriver for UI automation
* Appium for mobile app testing
* Postman for API testing
* JMeter for performance and load testing
* OWASP ZAP for security testing
* axe-core for accessibility testing
* Jira for defect tracking

**Test Data:**

* Dummy users (students, teachers, admins, parents with relationships)
* Classes with enrolled students and assigned teachers
* Class schedules with time windows
* Historical attendance records
* Parent-child relationship mappings
* Sample CSV files for bulk import testing

**Integration Test Environment:**

* Mock LDAP server with test user accounts
* Test email server for notification verification
* Test SMS gateway with message tracking
* Sample QR codes and proximity card data

**7. Test Schedule**

|  |  |
| --- | --- |
| **Milestone** | **Date** |
| Test Case Design & Review | 12-09-2025 |
| Environment Setup & Integration Config | 14-09-2025 |
| Test Execution Start (Functional) | 15-09-2025 |
| Integration & Security Testing | 18-09-2025 |
| Performance & Load Testing | 22-09-2025 |
| Mobile App Testing | 25-09-2025 |
| Accessibility & Compliance Testing | 26-09-2025 |
| Test Execution End | 28-09-2025 |
| User Acceptance Testing | 29-09-2025 to 02-10-2025 |

**8. Test Deliverables**

* Test Plan Document (this document)
* Detailed Test Cases (manual & automated)
* Mobile App Test Scripts
* Integration Test Scripts and API Collections
* Accessibility Test Reports
* FERPA Compliance Verification Report
* Performance Test Results and Load Analysis
* Security Test Report and Penetration Test Results
* Test Execution Logs and Screenshots
* Defect Reports and Retests
* Test Summary and Closure Report

**9. Roles and Responsibilities**

|  |  |  |
| --- | --- | --- |
| **Role** | **Name** | **Responsibility** |
| QA Lead | Your Name | Prepare plan, supervise testing activities, compliance verification |
| Test Engineer | Collaborator | Design & execute test cases, log defects, mobile testing |
| Security Tester | Security Team | Conduct security and penetration testing |
| Accessibility Tester | UX Team | Perform WCAG compliance testing |
| Developer | Dev Team | Fix defects, support test environment, integration setup |
| Product Owner | Stakeholder | Review test results, approve release readiness |

**10. Risks and Mitigation**

|  |  |
| --- | --- |
| **Risk** | **Mitigation** |
| Delay in software build delivery | Regular coordination sync with development team |
| Test environment downtime | Backup environments and cloud availability |
| Dependencies on third-party services | Use stubs and mocks to simulate integrations |
| FERPA compliance verification delays | Early engagement with compliance team |
| Mobile device availability for testing | Device cloud services and emulator usage |
| Integration system unavailability | Sandbox environments for external services |

**11. Assumptions & Dependencies**

* Stable test data and user credentials available
* Network environment is stable with sufficient bandwidth
* All necessary software components deployed for testing
* External system credentials and access provided
* Mobile app builds available for both iOS and Android
* LDAP test server configured with sample users
* Email and SMS gateway test accounts active

**12. Suspension & Resumption Criteria**

**Suspend testing if:**

* Environment is unavailable for >4 hours
* Critical defects block >30% of test cases
* External integration services down for >2 hours
* Security vulnerabilities require immediate patches

**Resume testing if:**

* Blocking issues are resolved
* Test environment stable again
* Integration services restored
* Security patches verified

**13. Test Case Management & Traceability**

|  |  |
| --- | --- |
| **Req ID** | **Test Cases** |
| SAMS-F-001 | TC-Auth-01 to TC-Auth-06 |
| SAMS-F-002 | TC-Auth-07 to TC-Auth-09 |
| SAMS-F-010 | TC-Student-01 to TC-Student-03 |
| SAMS-F-011 | TC-Student-04 to TC-Student-06 |
| SAMS-F-012 | TC-Student-07 to TC-Student-08 |
| SAMS-F-020 | TC-Attend-01 to TC-Attend-03 |
| SAMS-F-021 | TC-Attend-04 to TC-Attend-06 |
| SAMS-F-022 | TC-Attend-07 to TC-Attend-08 |
| SAMS-F-023 | TC-Attend-09 to TC-Attend-10 |
| SAMS-F-024 | TC-Attend-11 to TC-Attend-12 |
| SAMS-F-030 | TC-Notify-01 to TC-Notify-03 |
| SAMS-F-031 | TC-Notify-04 to TC-Notify-05 |
| SAMS-F-032 | TC-Notify-06 to TC-Notify-07 |
| SAMS-F-040 | TC-Report-01 to TC-Report-04 |
| SAMS-F-041 | TC-Report-05 to TC-Report-07 |
| SAMS-F-042 | TC-Report-08 to TC-Report-09 |
| SAMS-F-043 | TC-Report-10 to TC-Report-11 |
| SAMS-NF-001 | TC-Perf-01 to TC-Perf-05 |
| SAMS-NF-002 | TC-Perf-06 to TC-Perf-07 |
| SAMS-NF-003 | TC-Comp-01 to TC-Comp-05 |
| SAMS-NF-004 | TC-Backup-01 to TC-Backup-03 |
| SAMS-NF-005 | TC-Access-01 to TC-Access-08 |
| SAMS-SR-001 | TC-Sec-01 to TC-Sec-02 |
| SAMS-SR-002 | TC-Sec-03 to TC-Sec-04 |
| SAMS-SR-003 | TC-Sec-05 to TC-Sec-06 |
| SAMS-SR-004 | TC-Sec-07 to TC-Sec-08 |
| SAMS-SR-005 | TC-Sec-09 to TC-Sec-12 |

**14. Test Metrics & Reporting**

* Percentage of test cases executed and passed
* Defect density and severity distribution
* Requirement coverage percentage
* Defect aging and resolution time
* Performance benchmarks achievement
* Security vulnerability count and severity
* Accessibility compliance score
* FERPA compliance verification status

**Reports provided:** daily status reports, detailed defect reports, security assessment summary, accessibility audit report, performance analysis, final test summary report.

**15. Approvals**

|  |  |  |
| --- | --- | --- |
| **Role** | **Name** | **Signature / Date** |
| QA Lead |  |  |
| Development Lead |  |  |
| Security Lead |  |  |
| Compliance Officer |  |  |
| Product Owner |  |  |

**Core Test Cases for Student Attendance Management System (SAMS)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **#** | **TC ID** | **Req ID** | **Test Description** | **Expected Result** |
| **Authentication & Authorization (High Priority)** |  |  |  |  |
| 1 | TC-Auth-01 | SAMS-F-001 | Student login with valid credentials | Login successful; student dashboard displayed |
| 2 | TC-Auth-02 | SAMS-F-001 | Teacher login with valid LDAP credentials | Login successful; teacher dashboard displayed |
| 3 | TC-Auth-03 | SAMS-F-001 | Admin login with SSO integration | Login successful; admin panel accessible |
| 4 | TC-Auth-04 | SAMS-F-001 | Parent login with valid credentials | Login successful; parent portal displayed |
| 5 | TC-Auth-05 | SAMS-F-001 | Login with invalid password | Error message "Invalid credentials" shown |
| 6 | TC-Auth-06 | SAMS-F-002 | Session timeout after 30 minutes | User logged out and redirected to login |
| 7 | TC-Auth-07 | SAMS-F-002 | Student attempts admin function access | Access denied; appropriate error message |
| 8 | TC-Auth-08 | SAMS-F-002 | Parent attempts to view other child's data | Access denied; only own child's data visible |
| **Student Management (Critical Business Functions)** |  |  |  |  |
| 9 | TC-Student-01 | SAMS-F-010 | Admin adds new student record | Student record created successfully with audit log |
| 10 | TC-Student-02 | SAMS-F-010 | Admin edits existing student information | Changes saved and reflected in system |
| 11 | TC-Student-03 | SAMS-F-011 | Bulk import students via CSV file | All valid records imported; errors reported |
| 12 | TC-Student-04 | SAMS-F-011 | CSV import with invalid data format | Import fails with detailed error messages |
| 13 | TC-Student-05 | SAMS-F-012 | View student enrollment history | Complete enrollment history displayed accurately |
| **Core Attendance Recording (System's Primary Function)** |  |  |  |  |
| 14 | TC-Attend-01 | SAMS-F-020 | Teacher marks attendance manually | Attendance recorded with timestamp |
| 15 | TC-Attend-02 | SAMS-F-020 | Mark attendance for absent student | Absence recorded correctly |
| 16 | TC-Attend-03 | SAMS-F-020 | Attempt duplicate attendance marking | System prevents duplicate entries |
| 17 | TC-Attend-04 | SAMS-F-021 | Student scans QR code for attendance | Attendance marked within time window |
| 18 | TC-Attend-05 | SAMS-F-021 | QR code scan outside class time | Attendance rejected with error message |
| 19 | TC-Attend-06 | SAMS-F-022 | Attendance validation against schedule | Only scheduled class attendance accepted |
| 20 | TC-Attend-07 | SAMS-F-023 | Teacher modifies previous attendance | Change recorded with audit trail |
| 21 | TC-Attend-08 | SAMS-F-024 | Student taps proximity card | Attendance recorded for enrolled student |
| **Notifications (Essential for Parent Communication)** |  |  |  |  |
| 22 | TC-Notify-01 | SAMS-F-030 | Email notification on absence threshold | Email sent to parent within configured time |
| 23 | TC-Notify-02 | SAMS-F-030 | Email notification content verification | Accurate student info and absence details |
| 24 | TC-Notify-03 | SAMS-F-031 | SMS alert for critical attendance issue | SMS delivered via gateway API |
| 25 | TC-Notify-04 | SAMS-F-032 | Parent configures notification preferences | Preferences saved and respected |
| **Reporting & Analytics (Core Administrative Need)** |  |  |  |  |
| 26 | TC-Report-01 | SAMS-F-040 | Generate daily attendance report | Report displays accurate data with filters |
| 27 | TC-Report-02 | SAMS-F-040 | Generate monthly attendance summary | Correct monthly data aggregation |
| 28 | TC-Report-03 | SAMS-F-041 | Export report as PDF | PDF generated with charts and tables |
| 29 | TC-Report-04 | SAMS-F-041 | Export report as CSV | CSV file generated and downloadable |
| 30 | TC-Report-05 | SAMS-F-042 | View attendance analytics dashboard | Charts and trends display accurately |
| 31 | TC-Report-06 | SAMS-F-043 | Attendance percentage calculation | Accurate percentage with policy compliance |
| **Performance & Reliability (Non-Functional Essentials)** |  |  |  |  |
| 32 | TC-Perf-01 | SAMS-NF-001 | System response under normal load | Response time ≤ 3 seconds for 95% requests |
| 33 | TC-Perf-02 | SAMS-NF-001 | Concurrent user load testing | System handles 10,000 concurrent users |
| 34 | TC-Perf-03 | SAMS-NF-001 | Peak attendance marking performance | Response time maintained during peak usage |
| 35 | TC-Perf-04 | SAMS-NF-002 | System availability monitoring | Uptime ≥ 99.5% during academic hours |
| **FERPA Compliance (Legal Requirement)** |  |  |  |  |
| 36 | TC-Comp-01 | SAMS-NF-003 | Student data access by role | Data access restricted per FERPA guidelines |
| 37 | TC-Comp-02 | SAMS-NF-003 | Parent data access verification | Parents see only their child's data |
| 38 | TC-Comp-03 | SAMS-NF-003 | Data sharing audit trail | All data access logged with user details |
| **Critical Security Testing** |  |  |  |  |
| 39 | TC-Sec-01 | SAMS-SR-001 | HTTPS encryption verification | All traffic encrypted with TLS 1.2+ |
| 40 | TC-Sec-02 | SAMS-SR-002 | Password complexity enforcement | System enforces password requirements |
| 41 | TC-Sec-03 | SAMS-SR-003 | Audit log generation | All user actions logged with timestamps |
| 42 | TC-Sec-04 | SAMS-SR-005 | SQL injection prevention | Malicious SQL inputs blocked |
| 43 | TC-Sec-05 | SAMS-SR-005 | XSS attack prevention | Cross-site scripting attempts blocked |
| **Accessibility Compliance (WCAG 2.1 AA)** |  |  |  |  |
| 44 | TC-Access-01 | SAMS-NF-005 | Screen reader compatibility | All content accessible via screen reader |
| 45 | TC-Access-02 | SAMS-NF-005 | Keyboard navigation | All functions accessible via keyboard |
| 46 | TC-Access-03 | SAMS-NF-005 | Color contrast compliance | All text meets WCAG contrast requirements |
| **Mobile Application (Essential for Modern Usage)** |  |  |  |  |
| 47 | TC-Mobile-01 | SAMS-F-021 | Mobile QR code scanning | QR codes scan successfully on mobile |
| 48 | TC-Mobile-02 | Multiple | Mobile responsive design | UI elements display correctly on various screen sizes |
| 49 | TC-Mobile-03 | Multiple | Mobile offline functionality | App handles network disconnection gracefully |
| **Integration Testing (External Dependencies)** |  |  |  |  |
| 50 | TC-Int-01 | SAMS-F-001 | LDAP authentication integration | LDAP login works correctly |
| 51 | TC-Int-02 | SAMS-F-030 | SMTP email integration | Emails sent successfully via SMTP |
| 52 | TC-Int-03 | SAMS-F-031 | SMS gateway integration | SMS messages delivered via gateway |
| **Critical Error Scenarios** |  |  |  |  |
| 53 | TC-Error-01 | Multiple | Network disconnect during attendance marking | Warning shown; data saved after reconnect |
| 54 | TC-Error-02 | Multiple | Database connection loss during operation | Operation fails gracefully; user notified |
| **Backup & Recovery (Data Protection)** |  |  |  |  |
| 55 | TC-Backup-01 | SAMS-NF-004 | Daily backup execution | Backup completed within scheduled time |
| 56 | TC-Backup-02 | SAMS-NF-004 | Data restore procedure | Data restored within 4 hours |
| **Parent Portal (Stakeholder Engagement)** |  |  |  |  |
| 57 | TC-Parent-01 | Multiple | Parent dashboard access | Parents can access child's attendance data |
| 58 | TC-Parent-02 | SAMS-F-032 | Parent notification preferences | Parents can configure notification settings |