

- Shadanga Kriya - Test Cases Document
 - Document Information
 - Table of Contents
 - Test Environment Setup
 - Prerequisites
 - Test Data
 - 1. Authentication & User Management
 - TC-AUTH-001: User Registration (Learner Only)
 - TC-AUTH-002: Login with Valid Credentials
 - TC-AUTH-003: Login with Invalid Credentials
 - TC-AUTH-004: Account Lockout After 5 Failed Attempts
 - TC-AUTH-005: Password Reset Flow
 - TC-AUTH-006: Strong Password Validation
 - TC-AUTH-007: JWT Token Expiration
 - 2. Public Pages (No Authentication)
 - TC-PUBLIC-001: About Page Access
 - TC-PUBLIC-002: Vision/Mission Page
 - TC-PUBLIC-003: Gallery Page
 - TC-PUBLIC-004: Contact Page
 - TC-PUBLIC-005: Protected Route Access Prevention
 - 3. Learner Mobile App
 - 3.1 Course Discovery & Enrollment
 - TC-LEARNER-001: View Available Courses
 - TC-LEARNER-002: Course Purchase Flow (Razorpay)
 - TC-LEARNER-003: View Enrolled Courses Only
 - 3.2 Lesson Access & Pre-Lesson Protocol
 - TC-LEARNER-004: Sequential Lesson Unlocking
 - TC-LEARNER-005: Pre-Lesson Protocol - Flight Mode Check
 - TC-LEARNER-006: Pre-Lesson Protocol - Earphone Check
 - TC-LEARNER-007: Pre-Lesson Protocol - Focus Commitment
 - TC-LEARNER-008: Pre-Lesson Protocol - Incomplete Checklist
 - TC-LEARNER-009: Admin-Configurable Protocol Checks
 - 3.3 Audio Playback & Controls
 - TC-LEARNER-010: Audio Playback - Basic Play/Pause
 - TC-LEARNER-011: Audio Playback - Offline Enforcement
 - TC-LEARNER-012: Audio Playback - No Seeking
 - TC-LEARNER-013: Pause Limit - 3 Pauses Maximum

- TC-LEARNER-014: Pause Limit - Resume Before Auto-Complete
 - TC-LEARNER-015: Audio Playback - Screen Lock (Wake Lock)
 - TC-LEARNER-016: Audio Playback - Background Playback Prevention
 - TC-LEARNER-017: Audio Playback - Encrypted Audio Loading
 - TC-LEARNER-018: Lesson Completion
 - TC-LEARNER-019: Audio Download for Offline Use
 - 3.4 On-Site Course Flow
 - TC-LEARNER-020: On-Site Course - Attendance Requirement
 - TC-LEARNER-021: On-Site Course - After Attendance Marked
 - 3.5 Progress & History
 - TC-LEARNER-022: View Course Progress
 - TC-LEARNER-023: View Payment History
 - TC-LEARNER-024: Dashboard Statistics
- 4. Admin Web Panel
 - 4.1 Admin Authentication & Dashboard
 - TC-ADMIN-001: Admin Login
 - TC-ADMIN-002: Admin Dashboard Overview
 - 4.2 User Management
 - TC-ADMIN-003: Create New User (Manual)
 - TC-ADMIN-004: Create Admin/Facilitator User
 - TC-ADMIN-005: Activate/Deactivate User
 - TC-ADMIN-006: Reset User Password
 - TC-ADMIN-007: Assign Course to User
 - 4.3 Course Management
 - TC-ADMIN-008: Create New Course
 - TC-ADMIN-009: Edit Existing Course
 - TC-ADMIN-010: Activate/Deactivate Course
 - TC-ADMIN-011: Delete Course
 - 4.4 Lesson Management
 - TC-ADMIN-012: Add Lesson to Course
 - TC-ADMIN-013: Upload Audio File with Encryption
 - TC-ADMIN-014: Set Lesson Duration and Rules
 - TC-ADMIN-015: Reorder Lessons
 - 4.5 Lesson Monitoring & Control
 - TC-ADMIN-016: View Lesson Statistics
 - TC-ADMIN-017: Grant Extra Pause to User
 - TC-ADMIN-018: Reset Lesson Progress
 - TC-ADMIN-019: Lock Lesson for User

- 4.6 Payment Management
 - TC-ADMIN-020: View All Transactions
 - TC-ADMIN-021: Manual Course Activation
 - TC-ADMIN-022: Configure Payment Gateway
 - TC-ADMIN-023: Download Payment Reports
 - 4.7 Facilitator Management
 - TC-ADMIN-024: Create Facilitator Account
 - TC-ADMIN-025: Assign Courses to Facilitator
 - TC-ADMIN-026: Control Facilitator Permissions
 - 4.8 Analytics & Reports
 - TC-ADMIN-027: View Course Completion Analytics
 - TC-ADMIN-028: View User Engagement Analytics
 - TC-ADMIN-029: View Lesson Interruption Data
 - TC-ADMIN-030: Payment Summary Analytics
 - 4.9 Playback Settings Configuration
 - TC-ADMIN-031: Configure Pre-Lesson Protocol Checks
 - TC-ADMIN-032: Configure Pause Behavior
- 5. Facilitator Panel
 - TC-FACILITATOR-001: Facilitator Login
 - TC-FACILITATOR-002: View Assigned Courses
 - TC-FACILITATOR-003: Mark Attendance
 - TC-FACILITATOR-004: View Attendance History
 - TC-FACILITATOR-005: Export Attendance Report
 - TC-FACILITATOR-006: Supervise Live Sessions
 - TC-FACILITATOR-007: View Session Reports
 - 6. Security Testing
 - TC-SECURITY-001: SQL Injection Prevention
 - TC-SECURITY-002: XSS (Cross-Site Scripting) Prevention
 - TC-SECURITY-003: JWT Token Security
 - TC-SECURITY-004: Password Hashing
 - TC-SECURITY-005: CORS Policy Enforcement
 - TC-SECURITY-006: Rate Limiting
 - TC-SECURITY-007: Helmet Security Headers
 - TC-SECURITY-008: Audio File Encryption
 - TC-SECURITY-009: Role-Based Access Control
 - TC-SECURITY-010: Session Hijacking Prevention
 - 7. Performance Testing
 - TC-PERFORMANCE-001: Page Load Time

- TC-PERFORMANCE-002: API Response Time
- TC-PERFORMANCE-003: Audio Streaming Performance
- TC-PERFORMANCE-004: Concurrent Users
- TC-PERFORMANCE-005: Large File Upload
- 8. Device Compatibility
 - TC-DEVICE-001: Android Version Compatibility
 - TC-DEVICE-002: Screen Size Compatibility
 - TC-DEVICE-003: Browser Compatibility (Web Admin)
 - TC-DEVICE-004: Orientation Change
 - TC-DEVICE-005: Low-End Device Performance
- 9. Offline Functionality
 - TC-OFFLINE-001: Download Lesson for Offline Use
 - TC-OFFLINE-002: Play Downloaded Lesson Offline
 - TC-OFFLINE-003: Progress Sync After Going Online
 - TC-OFFLINE-004: Offline Mode Enforcement
 - TC-OFFLINE-005: Download Management
- 10. Edge Cases & Error Handling
 - TC-EDGE-001: Empty Course (No Lessons)
 - TC-EDGE-002: Network Interruption During Payment
 - TC-EDGE-003: Audio File Corruption
 - TC-EDGE-004: Simultaneous Login from Multiple Devices
 - TC-EDGE-005: Expired JWT Token
 - TC-EDGE-006: Database Connection Failure
 - TC-EDGE-007: Invalid File Upload
 - TC-EDGE-008: Lesson Completion at Exactly Max Pauses
 - TC-EDGE-009: Course Prerequisite Chain
 - TC-EDGE-010: Special Characters in Input
- 11. Integration Testing
 - TC-INTEGRATION-001: End-to-End User Journey
 - TC-INTEGRATION-002: Payment to Enrollment Flow
 - TC-INTEGRATION-003: Facilitator Attendance to Lesson Access
 - TC-INTEGRATION-004: Admin Grant Extra Pause to Learner
- 12. Accessibility Testing
 - TC-ACCESSIBILITY-001: Screen Reader Compatibility
 - TC-ACCESSIBILITY-002: Color Contrast
 - TC-FACILITATOR-004: View Attendance History
 - TC-FACILITATOR-005: Supervise Live Sessions
 - TC-FACILITATOR-006: View Session Reports

- TC-FACILITATOR-007: Export Attendance Report
- 6. Security Testing
 - TC-SECURITY-001: SQL Injection Prevention
 - TC-SECURITY-002: XSS Prevention
 - TC-SECURITY-003: CSRF Protection
 - TC-SECURITY-004: JWT Token Security
 - TC-SECURITY-005: Password Hashing
 - TC-SECURITY-006: Rate Limiting
 - TC-SECURITY-007: CORS Policy
 - TC-SECURITY-008: Security Headers (Helmet)
 - TC-SECURITY-009: Audio File Encryption
 - TC-SECURITY-010: Role-Based Access Control
 - TC-SECURITY-011: Sensitive Data Exposure
 - TC-SECURITY-012: Input Validation
- 7. Performance Testing
 - TC-PERF-001: Page Load Time
 - TC-PERF-002: API Response Time
 - TC-PERF-003: Audio Streaming Performance
 - TC-PERF-004: Concurrent Users Load Test
 - TC-PERF-005: Database Query Performance
 - TC-PERF-006: Large File Upload
- 8. Device Compatibility
 - TC-DEVICE-001: Android Version Compatibility
 - TC-DEVICE-002: Screen Size Compatibility
 - TC-DEVICE-003: Browser Compatibility (Web Panel)
 - TC-DEVICE-004: Network Conditions
 - TC-DEVICE-005: Battery Impact
 - TC-DEVICE-006: Storage Management
- 9. Offline Functionality
 - TC-OFFLINE-001: Download Lesson for Offline Use
 - TC-OFFLINE-002: Offline Playback Enforcement
 - TC-OFFLINE-003: Progress Sync After Offline Session
 - TC-OFFLINE-004: Multiple Lesson Downloads
 - TC-OFFLINE-005: Delete Downloaded Lesson
 - TC-OFFLINE-006: Offline Mode Without Download
- 10. Edge Cases & Error Handling
 - TC-EDGE-001: Empty Course (No Lessons)
 - TC-EDGE-002: Extremely Long Text Input

- TC-EDGE-003: Special Characters in Input
- TC-EDGE-004: Network Interruption During Payment
- TC-EDGE-005: Simultaneous Login from Multiple Devices
- TC-EDGE-006: Audio File Corruption
- TC-EDGE-007: Expired JWT Token During Session
- TC-EDGE-008: Database Connection Loss
- TC-EDGE-009: Lesson Completion at Exactly 100%
- TC-EDGE-010: Rapid Pause/Resume Clicks
- Test Execution Summary
 - Test Coverage Matrix
- Test Environment Requirements
 - Hardware Requirements
 - Software Requirements
 - Test Data Requirements
- Test Execution Guidelines
 - Priority Levels
 - Test Execution Order
 - Pass/Fail Criteria
- Bug Severity Classification
 - Critical (P0)
 - High (P1)
 - Medium (P2)
 - Low (P3)
- Test Reporting
 - Daily Test Report
 - Final Test Report
- Appendix
 - Test Tools
 - Reference Documents

Shadanga Kriya - Test Cases Document

Document Information

Project: Audio-Based Training Courses App (Shadanga Kriya)

Version: 1.0

Date: January 12, 2026

Test Type: End-to-End Production-Grade Testing

Target Platform: Android (Play Store Deployment)

Table of Contents

1. [Test Environment Setup](#)
 2. [Authentication & User Management](#)
 3. [Public Pages \(No Authentication\)](#)
 4. [Learner Mobile App](#)
 5. [Admin Web Panel](#)
 6. [Facilitator Panel](#)
 7. [Security Testing](#)
 8. [Performance Testing](#)
 9. [Device Compatibility](#)
 10. [Offline Functionality](#)
-

Test Environment Setup

Prerequisites

- Android device (API 24+) or emulator
- Web browser (Chrome, Firefox, Safari)
- Test user accounts (Learner, Admin, Facilitator)
- Test payment gateway (Razorpay sandbox)
- Network simulation tools (for offline testing)

Test Data

- **Admin Account:** admin@test.com / Admin@123
- **Facilitator Account:** facilitator@test.com / Faci@123
- **Learner Account:** learner@test.com / Learn@123
- **Test Course:** "Introduction to Meditation" (3 lessons, 60 min each)

- **Test Payment:** ₹999 (Razorpay test mode)

1. Authentication & User Management

TC-AUTH-001: User Registration (Learner Only)

Priority: High

Type: Functional

Preconditions:

- App is installed and launched
 - No existing account with test email

Test Steps:

1. Navigate to registration screen
 2. Enter valid details:
 - o Email: newlearner@test.com
 - o Password: Test@1234
 - o First Name: Test
 - o Last Name: User
 3. Submit registration form

Expected Results:

- Registration successful
 - User role is automatically set to "learner"
 - JWT token is generated
 - User is redirected to learner dashboard
 - Admin receives notification about new registration

Test Data:

```
{  
  "email": "newlearner@test.com",  
  "password": "Test@1234",  
  "firstName": "Test",
```

```
        "lastName": "User"  
    }  
  
-----
```

TC-AUTH-002: Login with Valid Credentials

Priority: High

Type: Functional

Test Steps:

1. Navigate to login screen
2. Enter email: learner@test.com
3. Enter password: Learn@123
4. Click "Login"

Expected Results:

- Login successful
 - JWT token stored securely
 - User redirected to appropriate dashboard based on role
 - Last active timestamp updated
 - Login attempts counter reset to 0
-

TC-AUTH-003: Login with Invalid Credentials

Priority: High

Type: Negative Testing

Test Steps:

1. Navigate to login screen
2. Enter email: learner@test.com
3. Enter wrong password: WrongPass@123
4. Click "Login"

Expected Results:

- Login fails with error message

- "Invalid credentials" message displayed
 - Login attempts counter incremented
 - Remaining attempts shown (4 remaining after 1st failure)
 - User remains on login screen
-

TC-AUTH-004: Account Lockout After 5 Failed Attempts

Priority: High

Type: Security

Test Steps:

1. Attempt login with wrong password 5 times consecutively
2. Observe the response after 5th attempt
3. Wait 15 minutes
4. Attempt login with correct password

Expected Results:

- After 5 failed attempts, account is locked
 - Error message: "Account locked due to multiple failed login attempts"
 - `locked_until` timestamp set to current time + 15 minutes
 - Login blocked for 15 minutes
 - After 15 minutes, login with correct credentials succeeds
 - Login attempts counter reset after successful login
-

TC-AUTH-005: Password Reset Flow

Priority: Medium

Type: Functional

Test Steps:

1. Click "Forgot Password" on login screen
2. Enter email: learner@test.com
3. Submit request

4. Check server logs for reset token
5. Navigate to reset URL with token
6. Enter new password: NewPass@123
7. Confirm new password
8. Submit reset form
9. Login with new password

Expected Results:

- Reset request accepted (generic success message)
 - Reset token generated and stored in database
 - Token expires after 1 hour
 - Old tokens invalidated when new token generated
 - Password reset successful with valid token
 - Password meets strength requirements
 - Token marked as "used" after successful reset
 - Login with new password succeeds
-

TC-AUTH-006: Strong Password Validation

Priority: High

Type: Validation

Test Data:

Password	Expected Result
weak	<input checked="" type="checkbox"/> Rejected - Too short
weakpassword	<input checked="" type="checkbox"/> Rejected - No uppercase, number, special char
WeakPass	<input checked="" type="checkbox"/> Rejected - No number, special char
WeakPass1	<input checked="" type="checkbox"/> Rejected - No special char
Weak@123	<input checked="" type="checkbox"/> Accepted - Meets all requirements

Expected Results:

- Password must be at least 8 characters
- Must contain uppercase letter

- Must contain lowercase letter
 - Must contain number
 - Must contain special character (@\$!%*?&)
-

TC-AUTH-007: JWT Token Expiration

Priority: Medium

Type: Security

Test Steps:

1. Login successfully
2. Store JWT token
3. Wait for token expiration (7 days)
4. Attempt to access protected endpoint

Expected Results:

- Token expires after 7 days
 - Expired token rejected with 401 Unauthorized
 - User redirected to login screen
 - Error message: "Session expired, please login again"
-

2. Public Pages (No Authentication)

TC-PUBLIC-001: About Page Access

Priority: Medium

Type: Functional

Test Steps:

1. Open app without logging in
2. Navigate to "About" page
3. Verify content is visible

Expected Results:

- Page loads without authentication
 - Organization details displayed
 - Team information visible
 - Values and mission statement shown
 - No course or lesson content accessible
-

TC-PUBLIC-002: Vision/Mission Page

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Vision/Mission" page without login
2. Verify content accessibility

Expected Results:

- Page accessible without authentication
 - Vision statement displayed
 - Mission statement displayed
 - Content properly formatted
-

TC-PUBLIC-003: Gallery Page

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Gallery" page
2. Click on image thumbnails
3. Test image lightbox functionality

Expected Results:

- Gallery accessible without login
- Images load correctly

- Lightbox opens on image click
 - Navigation between images works
 - Close button functions properly
 - No video content present (images only)
-

TC-PUBLIC-004: Contact Page

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Contact" page
2. Fill contact form with valid data
3. Submit form

Expected Results:

- Contact form accessible without login
 - Address, phone, email displayed
 - Form submission works
 - Validation errors shown for invalid input
 - Success message after submission
-

TC-PUBLIC-005: Protected Route Access Prevention

Priority: High

Type: Security

Test Steps:

1. Without logging in, attempt to access:
 - /learner/dashboard
 - /learner/courses
 - /admin/dashboard
 - /facilitator/dashboard

Expected Results:

- All protected routes redirect to login
 - No course content accessible
 - No audio files accessible
 - Error message: "Please login to access this page"
-

3. Learner Mobile App

3.1 Course Discovery & Enrollment

TC-LEARNER-001: View Available Courses

Priority: High

Type: Functional

Preconditions:

- User logged in as learner
- At least 3 courses exist in system

Test Steps:

1. Navigate to "Courses" or "Home" screen
2. View list of available courses
3. Check course information displayed

Expected Results:

- All active courses displayed
- Course title visible
- Course description shown
- Course type badge (Self-paced/On-site)
- Duration displayed
- Lesson count shown
- Price displayed
- Thumbnail image loaded
- Status badge (Locked/Active/Completed)

TC-LEARNER-002: Course Purchase Flow (Razorpay)

Priority: High

Type: Integration

Test Steps:

1. Select a locked course (not enrolled)
2. Click "Purchase" or "Enroll"
3. Review course details and price
4. Click "Proceed to Payment"
5. Complete Razorpay payment (test mode)
6. Return to app after payment

Expected Results:

- Payment modal opens with course details
 - Razorpay order created successfully
 - Razorpay checkout opens
 - Test payment completes successfully
 - Payment webhook received by backend
 - Enrollment created in database
 - Course status changes to "Active"
 - User redirected to course detail page
 - Success notification shown
-

TC-LEARNER-003: View Enrolled Courses Only

Priority: Medium

Type: Functional

Test Steps:

1. Login as learner

2. Navigate to "My Courses"
3. Verify only enrolled courses shown

Expected Results:

- Only purchased/assigned courses displayed
 - Locked courses not shown in "My Courses"
 - Progress percentage displayed for each course
 - Completion status visible
-

3.2 Lesson Access & Pre-Lesson Protocol

TC-LEARNER-004: Sequential Lesson Unlocking

Priority: High

Type: Business Logic

Preconditions:

- User enrolled in course with 3 lessons
- Lesson 1 not completed

Test Steps:

1. Open course detail page
2. Attempt to access Lesson 2 (without completing Lesson 1)
3. Complete Lesson 1
4. Attempt to access Lesson 2 again

Expected Results:

- Lesson 2 is locked initially
- Lock icon displayed on Lesson 2
- Click on Lesson 2 shows "Complete previous lesson first"
- After completing Lesson 1, Lesson 2 unlocks
- Lesson 2 becomes clickable
- Lesson 3 remains locked until Lesson 2 completed

TC-LEARNER-005: Pre-Lesson Protocol - Flight Mode Check

Priority: High

Type: Device Integration

Test Steps:

1. Click on available lesson
2. Pre-lesson protocol screen appears
3. Observe "Flight Mode Enabled" checkbox
4. Enable airplane mode on device
5. Click "Auto-check Device"
6. Observe checkbox status

Expected Results:

- Pre-lesson protocol screen displayed
 - Flight mode checkbox initially unchecked
 - Auto-check detects airplane mode when enabled
 - Checkbox automatically checked when airplane mode detected
 - Network status monitored in real-time
 - If network detected, checkbox unchecks automatically
 - Warning shown if network detected
-

TC-LEARNER-006: Pre-Lesson Protocol - Earphone Check

Priority: High

Type: Device Integration

Test Steps:

1. Navigate to pre-lesson protocol
2. Connect wired/Bluetooth earphones
3. Click "Auto-check Device"
4. Observe "Earphones Connected" checkbox

Expected Results:

- Earphone detection works on Android
 - Checkbox auto-checked when earphones detected
 - Toast notification: "Earphones detected"
 - Works with wired headphones
 - Works with Bluetooth headphones
 - Manual checkbox override available
-

TC-LEARNER-007: Pre-Lesson Protocol - Focus Commitment

Priority: Medium

Type: Functional

Test Steps:

1. On pre-lesson protocol screen
2. Check "Focus Commitment" checkbox
3. Verify all three checkboxes are checked
4. Click "Begin Session"

Expected Results:

- Focus commitment checkbox can be manually checked
 - "Begin Session" button disabled until all checked
 - "Begin Session" button enabled when all checked
 - Button changes from gray to primary color
 - Clicking button starts lesson
-

TC-LEARNER-008: Pre-Lesson Protocol - Incomplete Checklist

Priority: Medium

Type: Negative Testing

Test Steps:

1. On pre-lesson protocol screen
2. Check only 2 out of 3 items
3. Attempt to click "Begin Session"

Expected Results:

- "Begin Session" button remains disabled
 - Button shows "Complete Checklist to Continue"
 - Helper text: "Please confirm all items above to proceed"
 - Lesson does not start
-

TC-LEARNER-009: Admin-Configurable Protocol Checks

Priority: High

Type: Configuration

Preconditions:

- Admin has disabled flight mode check in settings

Test Steps:

1. Admin disables "Flight Mode Check" in playback settings
2. Learner navigates to pre-lesson protocol
3. Observe checklist items

Expected Results:

- Flight mode checkbox not shown
 - Only earphone and focus checks shown
 - "Begin Session" enabled with 2 checks instead of 3
 - Settings respected dynamically
-

3.3 Audio Playback & Controls

TC-LEARNER-010: Audio Playback - Basic Play/Pause

Priority: High

Type: Functional

Preconditions:

- Lesson downloaded for offline use
- Pre-lesson protocol completed
- Device in airplane mode

Test Steps:

1. Click "Begin Session"
2. Audio player screen loads
3. Click play button
4. Wait 10 seconds
5. Click pause button
6. Observe pause counter

Expected Results:

- Audio player loads successfully
- Play button visible and functional
- Audio starts playing
- Progress bar updates in real-time
- Current time updates every second
- Pause button works
- Audio pauses immediately
- Pause counter decrements (e.g., 3 → 2)
- Wake lock acquired during playback
- Wake lock released on pause

TC-LEARNER-011: Audio Playback - Offline Enforcement

Priority: High

Type: Business Logic

Test Steps:

1. Start lesson playback in airplane mode
2. Audio playing successfully
3. Disable airplane mode (connect to network)
4. Observe behavior

Expected Results:

- Audio pauses immediately when network detected
 - Warning message: "Internet connection detected. Please disconnect to continue playback."
 - Play button disabled while online
 - Badge shows "Online - Go Offline"
 - Re-enabling airplane mode allows playback to resume
-

TC-LEARNER-012: Audio Playback - No Seeking

Priority: High

Type: Business Logic

Test Steps:

1. Start audio playback
2. Attempt to click/drag progress bar
3. Attempt to skip forward/backward

Expected Results:

- Progress bar is non-interactive
 - No seek controls visible
 - Cannot skip to different time position
 - Footer notice: "Seeking is disabled. Please listen continuously for best results."
-

TC-LEARNER-013: Pause Limit - 3 Pauses Maximum

Priority: High

Type: Business Logic

Test Steps:

1. Start lesson playback
2. Pause audio (1st pause)
3. Resume and pause again (2nd pause)
4. Resume and pause again (3rd pause)
5. Attempt to resume and pause again (4th attempt)

Expected Results:

- First 3 pauses work normally
 - Pause counter shows: "3 pauses remaining" → "2" → "1" → "0"
 - After 3rd pause, counter shows "0 pauses remaining"
 - 30-second auto-complete timer starts
 - Warning: "Auto-completing in 30 seconds. Contact admin for additional pauses."
 - After 30 seconds, lesson marked as complete
 - Completion screen shown
-

TC-LEARNER-014: Pause Limit - Resume Before Auto-Complete

Priority: Medium

Type: Functional

Test Steps:

1. Use all 3 pauses
2. 30-second timer starts
3. Resume playback within 30 seconds
4. Observe behavior

Expected Results:

- Timer cancelled when playback resumed
 - Audio continues playing
 - Lesson not auto-completed
 - User can continue listening
 - No more pauses available
-

TC-LEARNER-015: Audio Playback - Screen Lock (Wake Lock)

Priority: Medium

Type: Device Integration

Test Steps:

1. Start audio playback
2. Wait for device screen timeout period
3. Observe screen behavior

Expected Results:

- Screen stays on during playback (wake lock active)
 - Screen dims but doesn't turn off
 - Audio continues playing
 - When paused, wake lock released
 - Screen can turn off when paused
-

TC-LEARNER-016: Audio Playback - Background Playback Prevention

Priority: High

Type: Business Logic

Test Steps:

1. Start audio playback

2. Press home button (minimize app)
3. Observe audio behavior
4. Return to app

Expected Results:

- Audio pauses when app goes to background
 - Pause counter decremented
 - When returning to app, audio remains paused
 - User must manually resume
-

TC-LEARNER-017: Audio Playback - Encrypted Audio Loading

Priority: High

Type: Security

Test Steps:

1. Download lesson for offline use
2. Check device file system
3. Attempt to play audio file directly
4. Start lesson in app

Expected Results:

- Audio file stored in encrypted format (AES-256-CBC)
 - File not playable outside app
 - File manager shows encrypted blob
 - App successfully decrypts and plays audio
 - Blob URL created for in-app playback only
-

TC-LEARNER-018: Lesson Completion

Priority: High

Type: Functional

Test Steps:

1. Start lesson playback
2. Let audio play to completion (or fast-forward in test mode)
3. Observe completion screen

Expected Results:

- Audio plays to end
 - Completion screen displayed
 - Success icon and message shown
 - "Continue to Course" button visible
 - Lesson marked as completed in database
 - Progress percentage updated
 - Next lesson unlocked (if applicable)
 - Certificate generated if course completed
-

TC-LEARNER-019: Audio Download for Offline Use

Priority: High

Type: Functional

Test Steps:

1. Navigate to course detail page
2. Click download icon on lesson
3. Wait for download to complete
4. Verify download status

Expected Results:

- Download button visible on each lesson
- Download progress indicator shown
- Audio encrypted during download
- Download stored in secure local storage
- "Downloaded" badge shown after completion
- Lesson playable offline
- Download size displayed

3.4 On-Site Course Flow

TC-LEARNER-020: On-Site Course - Attendance Requirement

Priority: High

Type: Business Logic

Preconditions:

- User enrolled in on-site course
- Facilitator has not marked attendance

Test Steps:

1. Navigate to on-site course detail
2. Attempt to start lesson
3. Observe behavior

Expected Results:

- Lesson shows "Attendance Required" status
 - Lesson is locked
 - Message: "Please check in with facilitator to mark attendance"
 - Cannot access pre-lesson protocol
 - Cannot start lesson
-

TC-LEARNER-021: On-Site Course - After Attendance Marked

Priority: High

Type: Business Logic

Preconditions:

- Facilitator has marked attendance for user

Test Steps:

1. Refresh course detail page
2. Observe lesson status
3. Click on lesson
4. Complete pre-lesson protocol
5. Start lesson

Expected Results:

- Lesson unlocked after attendance marked
 - "Attendance Required" badge removed
 - Pre-lesson protocol accessible
 - Lesson starts normally
 - Same playback rules apply (offline, pauses, etc.)
-

3.5 Progress & History

TC-LEARNER-022: View Course Progress

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Progress" page
2. View enrolled courses
3. Check progress details

Expected Results:

- All enrolled courses listed
 - Progress percentage displayed (0-100%)
 - Completed lessons count shown
 - Total lessons count shown
 - Time spent displayed
 - Completion date shown (if completed)
-

TC-LEARNER-023: View Payment History

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Progress" page
2. Click "Payments" tab
3. View payment history

Expected Results:

- All payments listed chronologically
 - Course name displayed
 - Amount paid shown
 - Payment date visible
 - Payment status (Success/Failed/Pending)
 - Transaction ID displayed
 - Payment method shown
-

TC-LEARNER-024: Dashboard Statistics

Priority: Medium

Type: Functional

Test Steps:

1. Login as learner
2. Navigate to dashboard
3. View statistics

Expected Results:

- Total enrolled courses count displayed
- Completed courses count shown
- In-progress courses count visible
- Total time spent displayed (hours/minutes)
- Recent activity shown

- Next lesson recommendation displayed
-

4. Admin Web Panel

4.1 Admin Authentication & Dashboard

TC-ADMIN-001: Admin Login

Priority: High

Type: Functional

Test Steps:

1. Navigate to admin login page
2. Enter admin credentials
3. Submit login form

Expected Results:

- Admin can login successfully
 - Redirected to admin dashboard
 - Admin role verified
 - Admin menu items visible
 - Learner/Facilitator features not accessible
-

TC-ADMIN-002: Admin Dashboard Overview

Priority: Medium

Type: Functional

Test Steps:

1. Login as admin
2. View dashboard

Expected Results:

- Total users count displayed
 - Total courses count shown
 - Active enrollments count visible
 - Revenue statistics displayed
 - Recent activities shown
 - Charts and graphs render correctly
 - Quick action buttons available
-

4.2 User Management

TC-ADMIN-003: Create New User (Manual)

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Users" section
2. Click "Add User"
3. Fill user details:
 - Email: testuser@example.com
 - Password: Test@1234
 - First Name: Test
 - Last Name: User
 - Role: Learner
4. Submit form

Expected Results:

- User creation form opens
 - All fields validated
 - User created successfully
 - User appears in user list
 - Default status: Active
 - Notification sent to user (if configured)
-

TC-ADMIN-004: Create Admin/Facilitator User

Priority: High

Type: Functional

Test Steps:

1. Click "Add User"
2. Select role: "Admin" or "Facilitator"
3. Fill required details
4. Submit form

Expected Results:

- Admin can create admin/facilitator accounts
 - Role properly assigned
 - Appropriate permissions granted
 - User can login with assigned role
-

TC-ADMIN-005: Activate/Deactivate User

Priority: High

Type: Functional

Test Steps:

1. Navigate to user list
2. Find active user
3. Click "Deactivate" button
4. Confirm action
5. User attempts to login

Expected Results:

- User status changed to "Inactive"
 - Deactivated user cannot login
 - Error: "Account is not active"
 - Reactivation restores login access
-

TC-ADMIN-006: Reset User Password

Priority: High

Type: Functional

Test Steps:

1. Navigate to user list
2. Click "Edit" on user
3. Enter new password: NewPass@123
4. Save changes
5. User logs in with new password

Expected Results:

- Password reset successful
 - Old password no longer works
 - New password works immediately
 - Password meets strength requirements
-

TC-ADMIN-007: Assign Course to User

Priority: High

Type: Functional

Test Steps:

1. Navigate to user detail page
2. Click "Assign Course"
3. Select course from dropdown
4. Submit assignment

Expected Results:

- Course assigned to user
- Enrollment created in database
- User can see course in "My Courses"
- No payment required for admin assignment
- Course status: Active

4.3 Course Management

TC-ADMIN-008: Create New Course

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Courses" section
2. Click "Add Course"
3. Fill course details:
 - Title: "Advanced Meditation"
 - Description: "Deep meditation techniques"
 - Type: Self-paced
 - Price: ₹1499
 - Duration: 10 hours
 - Category: Meditation
4. Upload thumbnail image
5. Submit form

Expected Results:

- Course created successfully
- Course appears in course list
- Default status: Draft
- Creator name recorded
- Thumbnail uploaded and displayed
- All fields saved correctly

TC-ADMIN-009: Edit Existing Course

Priority: High

Type: Functional

Test Steps:

1. Navigate to course list
2. Click "Edit" on course
3. Modify title and price
4. Save changes

Expected Results:

- Course details updated
 - Changes reflected immediately
 - Updated timestamp recorded
 - Enrolled users see updated info
-

TC-ADMIN-010: Activate/Deactivate Course

Priority: High

Type: Functional

Test Steps:

1. Select draft course
2. Change status to "Active"
3. Save changes
4. Verify course visibility

Expected Results:

- Course status changed to Active
 - Course visible to learners
 - Course appears in public catalog
 - Deactivating hides from learners
-

TC-ADMIN-011: Delete Course

Priority: Medium

Type: Functional

Test Steps:

1. Select course with no enrollments
2. Click "Delete"
3. Confirm deletion

Expected Results:

- Confirmation dialog shown
 - Course deleted from database
 - Course removed from list
 - Cannot delete course with active enrollments
-

4.4 Lesson Management

TC-ADMIN-012: Add Lesson to Course

Priority: High

Type: Functional

Test Steps:

1. Navigate to course detail
2. Click "Add Lesson"
3. Fill lesson details:
 - Title: "Breathing Techniques"
 - Description: "Learn proper breathing"
 - Duration: 60 minutes
 - Max Pauses: 3
 - Order: 1
4. Upload encrypted audio file
5. Submit form

Expected Results:

- Lesson created successfully
- Audio file uploaded and encrypted
- Lesson appears in course lessons list
- Order index set correctly
- Duration and pause settings saved

TC-ADMIN-013: Upload Audio File with Encryption

Priority: High

Type: Security

Test Steps:

1. Create/edit lesson
2. Upload audio file (MP3, 50MB)
3. Wait for upload to complete
4. Verify file storage

Expected Results:

- File upload progress shown
 - File encrypted with AES-256-CBC
 - Encrypted file stored securely
 - Original file not accessible
 - File size and duration extracted
 - Audio URL stored in database
-

TC-ADMIN-014: Set Lesson Duration and Rules

Priority: High

Type: Functional

Test Steps:

1. Edit lesson
2. Set duration: 65 minutes
3. Set max pauses: 5
4. Set access code (optional)
5. Save changes

Expected Results:

- Duration saved correctly
 - Max pauses setting applied
 - Access code stored (if provided)
 - Settings enforced during playback
-

TC-ADMIN-015: Reorder Lessons

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to course lessons
2. Drag lesson to new position
3. Save order

Expected Results:

- Lesson order updated
 - Order index recalculated
 - Sequential unlocking respects new order
 - Changes visible to learners immediately
-

4.5 Lesson Monitoring & Control

TC-ADMIN-016: View Lesson Statistics

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Monitoring" section
2. Select course and lesson
3. View statistics

Expected Results:

- Total plays count displayed
 - Completed count shown
 - Skipped/Interrupted count visible
 - Average completion time displayed
 - Pause usage statistics shown
 - User-wise breakdown available
-

TC-ADMIN-017: Grant Extra Pause to User

Priority: High

Type: Functional

Test Steps:

1. Navigate to monitoring page
2. Find user who exhausted pauses
3. Click "Grant Extra Pause"
4. Specify number of pauses (e.g., 3)
5. Confirm action

Expected Results:

- Extra pauses granted successfully
 - User's pause counter updated
 - User can resume lesson
 - Action logged in system
 - Admin notification sent
-

TC-ADMIN-018: Reset Lesson Progress

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to user's lesson progress
2. Click "Reset Progress"

3. Confirm action

Expected Results:

- Lesson progress deleted
 - User can restart lesson
 - Pause counter reset
 - Time spent reset to 0
 - Course progress percentage recalculated
-

TC-ADMIN-019: Lock Lesson for User

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to monitoring
2. Select user and lesson
3. Click "Lock Lesson"
4. Confirm action

Expected Results:

- Lesson locked for user
 - Status changed to "Interrupted"
 - User cannot access lesson
 - Lock icon displayed to user
 - Admin can unlock later
-

4.6 Payment Management

TC-ADMIN-020: View All Transactions

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Payments" section
2. View transaction list
3. Apply filters (date range, status)

Expected Results:

- All transactions listed
 - Transaction details displayed:
 - User name
 - Course name
 - Amount
 - Payment date
 - Status
 - Transaction ID
 - Filters work correctly
 - Pagination works
-

TC-ADMIN-021: Manual Course Activation

Priority: High

Type: Functional

Test Steps:

1. Navigate to payments
2. Find pending payment
3. Click "Manual Activation"
4. Confirm activation

Expected Results:

- Course activated for user
 - Enrollment created
 - Payment status updated
 - User can access course
 - Action logged
-

TC-ADMIN-022: Configure Payment Gateway

Priority: High

Type: Configuration

Test Steps:

1. Navigate to "Settings" > "Payment"
2. Enter Razorpay credentials:
 - Key ID
 - Key Secret
3. Save settings
4. Test payment flow

Expected Results:

- Credentials saved securely
 - Payment gateway initialized
 - Test payment works
 - Webhooks configured correctly
-

TC-ADMIN-023: Download Payment Reports

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to payments
2. Select date range
3. Click "Export CSV"
4. Click "Export PDF"

Expected Results:

- CSV file downloads with all transactions
- PDF report generates correctly
- All columns included
- Formatting correct

- File names include date range
-

4.7 Facilitator Management

TC-ADMIN-024: Create Facilitator Account

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Sub Admins" section
2. Click "Add Sub-Admin"
3. Fill details:
 - Email: facilitator@test.com
 - Password: Faci@1234
 - First Name: Test
 - Last Name: Facilitator
 - Role: Facilitator
4. Assign permissions:
 - ✓ Mark Attendance
 - ✓ View Sessions
5. Assign courses
6. Submit form

Expected Results:

- Facilitator account created
 - Permissions saved correctly
 - Course assignments recorded
 - Facilitator can login
 - Only assigned permissions available
-

TC-ADMIN-025: Assign Courses to Facilitator

Priority: High

Type: Functional

Test Steps:

1. Edit facilitator account
2. Select courses to assign
3. Save changes

Expected Results:

- Courses assigned successfully
 - Facilitator can see only assigned courses
 - Facilitator can manage assigned courses only
-

TC-ADMIN-026: Control Facilitator Permissions

Priority: High

Type: Authorization

Test Steps:

1. Edit facilitator
2. Enable/disable permissions:
 - Mark Attendance
 - View Reports
 - Supervise Sessions
3. Save changes
4. Facilitator logs in

Expected Results:

- Permissions updated
 - Facilitator UI reflects permissions
 - Disabled features not accessible
 - API endpoints enforce permissions
-

4.8 Analytics & Reports

TC-ADMIN-027: View Course Completion Analytics

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Analytics" section
2. View course performance chart

Expected Results:

- Chart displays course-wise completion rates
 - Data accurate and up-to-date
 - Interactive chart (hover, click)
 - Export option available
-

TC-ADMIN-028: View User Engagement Analytics

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to analytics
2. View engagement metrics

Expected Results:

- Weekly engagement chart displayed
 - Active users count shown
 - Average session duration displayed
 - Trend analysis available
-

TC-ADMIN-029: View Lesson Interruption Data

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to analytics
2. View session outcomes

Expected Results:

- Pie chart shows:
 - Completed sessions
 - Interrupted sessions
 - Skipped sessions
 - Percentages calculated correctly
 - Data filterable by date range
-

TC-ADMIN-030: Payment Summary Analytics

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to analytics
2. View revenue section

Expected Results:

- Total revenue displayed
 - Revenue by course shown
 - Monthly revenue trend chart
 - Payment success rate displayed
-

4.9 Playback Settings Configuration

TC-ADMIN-031: Configure Pre-Lesson Protocol Checks

Priority: High

Type: Configuration

Test Steps:

1. Navigate to "Settings" > "Playback"
2. Toggle settings:
 - Flight Mode Check: ON/OFF
 - Earphone Check: ON/OFF
 - Offline Mode Required: ON/OFF
3. Save settings
4. Learner starts lesson

Expected Results:

- Settings saved successfully
 - Changes applied immediately
 - Learner sees updated protocol
 - Disabled checks auto-checked
 - Enforcement respects settings
-

TC-ADMIN-032: Configure Pause Behavior

Priority: High

Type: Configuration

Test Steps:

1. Navigate to playback settings
2. Configure:
 - Auto-skip on max pauses: ON/OFF
 - Auto-skip delay: 30 seconds
 - Screen lock: ON/OFF
3. Save settings

Expected Results:

- Settings saved
 - Auto-skip behavior updated
 - Delay time respected
 - Screen lock setting applied
 - All learners affected
-

5. Facilitator Panel

TC-FACILITATOR-001: Facilitator Login

Priority: High

Type: Functional

Test Steps:

1. Navigate to login page
2. Enter facilitator credentials
3. Submit login

Expected Results:

- Facilitator logs in successfully
 - Redirected to facilitator dashboard
 - Only assigned courses visible
 - Permissions enforced
-

TC-FACILITATOR-002: View Assigned Courses

Priority: High

Type: Functional

Test Steps:

1. Login as facilitator
2. Navigate to "Courses"

Expected Results:

- Only assigned courses displayed
 - Course details visible
 - Lesson list accessible
 - Cannot see unassigned courses
-

TC-FACILITATOR-003: Mark Attendance

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Attendance"
2. Select course and session
3. Select learners present
4. Click "Mark Attendance"
5. Submit

Expected Results:

- Attendance form loads
 - Enrolled learners listed
 - Checkboxes for each learner
 - Attendance saved successfully
 - Learners can access lessons
 - Timestamp recorded
-

TC-FACILITATOR-004: View Attendance History

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Attendance" > "History"
2. Select course
3. View attendance records

Expected Results:

- All attendance records displayed
 - Date and time shown
 - Learner names listed
 - Present/Absent status visible
 - Filterable by date range
-

TC-FACILITATOR-005: Export Attendance Report

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to attendance history
2. Select date range
3. Click "Export CSV"

Expected Results:

- CSV file downloads
 - All attendance data included
 - Proper formatting
 - File name includes date range
-

TC-FACILITATOR-006: Supervise Live Sessions

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Sessions"
2. View active sessions
3. Monitor learner progress

Expected Results:

- Active sessions listed
 - Learner names shown
 - Current lesson displayed
 - Progress percentage visible
 - Real-time updates
-

TC-FACILITATOR-007: View Session Reports

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Reports"
2. Select course
3. View session statistics

Expected Results:

- Total sessions count
 - Completion rate displayed
 - Average duration shown
 - Learner-wise breakdown available
-

6. Security Testing

TC-SECURITY-001: SQL Injection Prevention

Priority: Critical

Type: Security

Test Steps:

1. Attempt SQL injection in login form:
 - Email: `admin@test.com' OR '1='1`
 - Password: `anything`
2. Attempt in search fields
3. Attempt in filter parameters

Expected Results:

- All inputs sanitized
 - Parameterized queries used
 - No SQL errors exposed
 - Injection attempts logged
 - No unauthorized access
-

TC-SECURITY-002: XSS (Cross-Site Scripting) Prevention

Priority: Critical

Type: Security

Test Steps:

1. Attempt XSS in user input fields:
 - Name: `<script>alert('XSS')</script>`
 - Description: ``
2. Submit forms
3. View rendered content

Expected Results:

- Scripts not executed
- HTML entities escaped
- Content sanitized
- No JavaScript execution

- CSP headers prevent inline scripts
-

TC-SECURITY-003: JWT Token Security

Priority: Critical

Type: Security

Test Steps:

1. Login and capture JWT token
2. Decode token (jwt.io)
3. Attempt to modify token
4. Use modified token in API request
5. Wait for token expiration (7 days)

Expected Results:

- Token contains only user ID
 - No sensitive data in token
 - Modified token rejected
 - Signature verification works
 - Expired token rejected
 - 401 Unauthorized returned
-

TC-SECURITY-004: Password Hashing

Priority: Critical

Type: Security

Test Steps:

1. Create user with password: Test@1234
2. Check database password_hash field
3. Verify bcrypt hash format
4. Attempt to login with hash directly

Expected Results:

- Password stored as bcrypt hash
 - Hash starts with $2a$ or $2b$
 - 12 rounds used (cost factor)
 - Plain password not stored
 - Hash cannot be used for login
-

TC-SECURITY-005: CORS Policy Enforcement

Priority: High

Type: Security

Test Steps:

1. Attempt API request from unauthorized origin
2. Check CORS headers in response
3. Verify allowed origins

Expected Results:

- Only whitelisted origins allowed
 - CORS headers present
 - Unauthorized origins blocked
 - Preflight requests handled
 - Credentials allowed only for trusted origins
-

TC-SECURITY-006: Rate Limiting

Priority: High

Type: Security

Test Steps:

1. Make 100+ requests to API in 15 minutes
2. Attempt 10+ login requests in 15 minutes
3. Attempt 5+ registration requests in 1 hour

Expected Results:

- General API: 100 requests per 15 min limit
 - Login: 5 requests per 15 min limit
 - Registration: 3 requests per hour limit
 - 429 Too Many Requests returned
 - Retry-After header present
-

TC-SECURITY-007: Helmet Security Headers

Priority: High

Type: Security

Test Steps:

1. Make API request
2. Inspect response headers

Expected Results:

- X-Content-Type-Options: nosniff
 - X-Frame-Options: DENY
 - X-XSS-Protection: 1; mode=block
 - Strict-Transport-Security present
 - Content-Security-Policy present
-

TC-SECURITY-008: Audio File Encryption

Priority: Critical

Type: Security

Test Steps:

1. Download lesson for offline use
2. Locate audio file in device storage
3. Attempt to play file with media player
4. Attempt to copy file to another device

Expected Results:

- File stored in encrypted format
 - AES-256-CBC encryption used
 - File not playable outside app
 - File manager shows encrypted blob
 - Copying file doesn't allow playback
-

TC-SECURITY-009: Role-Based Access Control

Priority: Critical

Type: Security

Test Steps:

1. Login as learner
2. Attempt to access admin endpoints:
 - GET /api/admin/users
 - POST /api/admin/courses
3. Attempt to access facilitator endpoints

Expected Results:

- 403 Forbidden returned
 - Error: "Insufficient permissions"
 - No data leaked
 - Action logged
 - Role verification enforced
-

TC-SECURITY-010: Session Hijacking Prevention

Priority: High

Type: Security

Test Steps:

1. Login from Device A

2. Copy JWT token
3. Use token on Device B
4. Logout from Device A
5. Attempt to use token on Device B

Expected Results:

- Token works on multiple devices (stateless)
 - Token expires after 7 days
 - No session fixation possible
 - Logout doesn't invalidate token (client-side removal)
 - Token refresh not implemented (7-day expiry)
-

7. Performance Testing

TC-PERFORMANCE-001: Page Load Time

Priority: Medium

Type: Performance

Test Steps:

1. Clear browser cache
2. Navigate to home page
3. Measure load time
4. Navigate to course detail page
5. Measure load time

Expected Results:

- Home page loads in < 3 seconds
 - Course detail loads in < 2 seconds
 - Images lazy-loaded
 - No blocking resources
 - Lighthouse score > 80
-

TC-PERFORMANCE-002: API Response Time

Priority: Medium

Type: Performance

Test Steps:

1. Make API requests and measure response time:
 - GET /api/courses
 - GET /api/courses/:id
 - POST /api/auth/login
 - GET /api/progress/course/:id

Expected Results:

- Course list: < 500ms
 - Course detail: < 300ms
 - Login: < 400ms
 - Progress: < 400ms
 - Database queries optimized
-

TC-PERFORMANCE-003: Audio Streaming Performance

Priority: High

Type: Performance

Test Steps:

1. Start lesson playback
2. Monitor audio buffering
3. Check memory usage
4. Play for 10 minutes

Expected Results:

- Audio starts within 2 seconds
- No buffering during playback
- Memory usage stable

- No memory leaks
 - Smooth playback
-

TC-PERFORMANCE-004: Concurrent Users

Priority: Medium

Type: Performance

Test Steps:

1. Simulate 50 concurrent users
2. All users login simultaneously
3. All users browse courses
4. Monitor server performance

Expected Results:

- Server handles 50+ concurrent users
 - Response times remain acceptable
 - No timeouts
 - No server crashes
 - Database connections managed
-

TC-PERFORMANCE-005: Large File Upload

Priority: Medium

Type: Performance

Test Steps:

1. Upload audio file (100MB)
2. Monitor upload progress
3. Verify encryption performance

Expected Results:

- Upload completes successfully
- Progress indicator accurate

- Encryption doesn't timeout
 - File size limit enforced (10MB payload limit)
 - Error handling for large files
-

8. Device Compatibility

TC-DEVICE-001: Android Version Compatibility

Priority: High

Type: Compatibility

Test Devices:

- Android 7.0 (API 24)
- Android 10.0 (API 29)
- Android 12.0 (API 31)
- Android 13.0 (API 33)

Test Steps:

1. Install app on each device
2. Test core functionality
3. Test device-specific features

Expected Results:

- App installs on all versions
 - UI renders correctly
 - All features work
 - Device checks work (flight mode, earphones)
 - Audio playback works
 - No crashes
-

TC-DEVICE-002: Screen Size Compatibility

Priority: High

Type: Compatibility

Test Devices:

- Small phone (5" screen)
- Medium phone (6" screen)
- Large phone (6.5" screen)
- Tablet (10" screen)

Test Steps:

1. Open app on each device
2. Navigate through all screens
3. Test UI responsiveness

Expected Results:

- UI adapts to screen size
 - No content cut off
 - Buttons accessible
 - Text readable
 - Images scale properly
-

TC-DEVICE-003: Browser Compatibility (Web Admin)

Priority: High

Type: Compatibility

Test Browsers:

- Chrome (latest)
- Firefox (latest)
- Safari (latest)
- Edge (latest)

Test Steps:

1. Open admin panel in each browser

2. Test all admin features
3. Verify UI consistency

Expected Results:

- Admin panel works in all browsers
 - UI consistent across browsers
 - No JavaScript errors
 - All features functional
-

TC-DEVICE-004: Orientation Change

Priority: Medium

Type: Compatibility

Test Steps:

1. Open app in portrait mode
2. Rotate device to landscape
3. Navigate through screens
4. Start lesson playback
5. Rotate during playback

Expected Results:

- UI adapts to orientation
 - No data loss on rotation
 - Audio continues playing
 - Layout remains usable
 - No crashes
-

TC-DEVICE-005: Low-End Device Performance

Priority: Medium

Type: Performance

Test Device:

- Android device with 2GB RAM
- Older processor (Snapdragon 400 series)

Test Steps:

1. Install and run app
2. Test audio playback
3. Monitor performance

Expected Results:

- App runs smoothly
 - Audio plays without stuttering
 - UI responsive
 - No excessive battery drain
 - Memory usage acceptable
-

9. Offline Functionality

TC-OFFLINE-001: Download Lesson for Offline Use

Priority: High

Type: Functional

Test Steps:

1. Connect to internet
2. Navigate to course detail
3. Click download icon on lesson
4. Wait for download to complete
5. Verify download status

Expected Results:

- Download starts immediately

- Progress indicator shown
 - Download completes successfully
 - "Downloaded" badge displayed
 - File stored in encrypted format
 - Download size displayed
-

TC-OFFLINE-002: Play Downloaded Lesson Offline

Priority: High

Type: Functional

Test Steps:

1. Download lesson
2. Enable airplane mode
3. Navigate to lesson
4. Complete pre-lesson protocol
5. Start playback

Expected Results:

- Lesson accessible offline
 - Pre-lesson protocol works
 - Audio plays smoothly
 - All playback controls work
 - Progress tracked locally
 - No network errors
-

TC-OFFLINE-003: Progress Sync After Going Online

Priority: High

Type: Functional

Test Steps:

1. Complete lesson offline
2. Disable airplane mode
3. Connect to internet
4. Wait for sync

Expected Results:

- Progress syncs automatically
 - Completion status updated on server
 - Next lesson unlocked
 - Course progress updated
 - No data loss
-

TC-OFFLINE-004: Offline Mode Enforcement

Priority: High

Type: Business Logic

Test Steps:

1. Start lesson in airplane mode
2. Audio playing
3. Disable airplane mode (connect to network)
4. Observe behavior

Expected Results:

- Audio pauses immediately
 - Warning message displayed
 - Play button disabled
 - Badge shows "Online - Go Offline"
 - Re-enabling airplane mode allows resume
-

TC-OFFLINE-005: Download Management

Priority: Medium

Type: Functional

Test Steps:

1. Download multiple lessons
2. View downloaded lessons list
3. Delete downloaded lesson
4. Re-download lesson

Expected Results:

- All downloads tracked
 - Storage space shown
 - Delete removes encrypted file
 - Re-download works
 - No duplicate downloads
-

10. Edge Cases & Error Handling

TC-EDGE-001: Empty Course (No Lessons)

Priority: Medium

Type: Edge Case

Test Steps:

1. Admin creates course
2. Don't add any lessons
3. Activate course
4. Learner enrolls in course
5. Learner views course detail

Expected Results:

- Course displays with 0 lessons
 - Message: "No lessons available yet"
 - No errors
 - Progress shows 0%
-

TC-EDGE-002: Network Interruption During Payment

Priority: High

Type: Edge Case

Test Steps:

1. Start payment process
2. Disconnect network during payment
3. Reconnect network
4. Check payment status

Expected Results:

- Payment gateway handles interruption
 - Webhook retries delivery
 - Payment status eventually updated
 - No duplicate charges
 - User notified of status
-

TC-EDGE-003: Audio File Corruption

Priority: Medium

Type: Edge Case

Test Steps:

1. Corrupt downloaded audio file
2. Attempt to play lesson
3. Observe error handling

Expected Results:

- Error message displayed
- "Failed to decrypt offline audio"
- Suggestion to re-download
- No app crash
- User can re-download

TC-EDGE-004: Simultaneous Login from Multiple Devices

Priority: Medium

Type: Edge Case

Test Steps:

1. Login on Device A
2. Login on Device B with same credentials
3. Use app on both devices

Expected Results:

- Both logins successful (stateless JWT)
 - Both devices work independently
 - Progress syncs from both
 - No conflicts
 - Last update wins
-

TC-EDGE-005: Expired JWT Token

Priority: High

Type: Edge Case

Test Steps:

1. Login successfully
2. Wait 7 days (or modify token expiry for testing)
3. Attempt to access protected resource

Expected Results:

- 401 Unauthorized returned
- User redirected to login
- Error: "Session expired"
- User can login again

- New token issued
-

TC-EDGE-006: Database Connection Failure

Priority: High

Type: Error Handling

Test Steps:

1. Stop database server
2. Attempt to login
3. Attempt to fetch courses

Expected Results:

- Graceful error handling
 - User-friendly error message
 - No server crash
 - Error logged
 - Retry mechanism (if implemented)
-

TC-EDGE-007: Invalid File Upload

Priority: Medium

Type: Edge Case

Test Steps:

1. Attempt to upload non-audio file as lesson audio
2. Attempt to upload file > 100MB
3. Attempt to upload corrupted audio file

Expected Results:

- File type validation
- File size validation
- Error messages displayed
- Upload rejected

- No partial uploads
-

TC-EDGE-008: Lesson Completion at Exactly Max Pauses

Priority: Medium

Type: Edge Case

Test Steps:

1. Start lesson with 3 max pauses
2. Pause 3 times
3. Let 30-second timer run
4. Resume before timer expires
5. Complete lesson

Expected Results:

- Timer cancelled on resume
 - Lesson continues normally
 - Completion recorded
 - No auto-skip triggered
-

TC-EDGE-009: Course Prerequisite Chain

Priority: Medium

Type: Edge Case

Test Steps:

1. Create Course A (no prerequisite)
2. Create Course B (prerequisite: Course A)
3. Create Course C (prerequisite: Course B)
4. Learner enrolls in Course C without completing A or B

Expected Results:

- Course C locked

- Message: "Complete prerequisite courses first"
 - Prerequisite chain displayed
 - Completing A unlocks B
 - Completing B unlocks C
-

TC-EDGE-010: Special Characters in Input

Priority: Medium

Type: Edge Case

Test Steps:

1. Create course with title: "Test™ Course® 2024©"
2. Create user with name: "José María O'Brien"
3. Enter description with emojis: "Great course! 😊 🎉"

Expected Results:

- Special characters saved correctly
 - Unicode characters supported
 - Display renders correctly
 - No encoding issues
 - Search works with special chars
-

11. Integration Testing

TC-INTEGRATION-001: End-to-End User Journey

Priority: Critical

Type: Integration

Test Steps:

1. User registers account
2. Admin assigns course

3. User downloads lesson
4. User completes pre-lesson protocol
5. User completes lesson
6. Progress syncs to server
7. Next lesson unlocks
8. User completes course
9. Certificate generated

Expected Results:

- All steps complete successfully
 - Data flows correctly between components
 - No errors at any step
 - Progress tracked accurately
 - Certificate generated
-

TC-INTEGRATION-002: Payment to Enrollment Flow

Priority: Critical

Type: Integration

Test Steps:

1. Learner selects course
2. Initiates payment
3. Completes Razorpay payment
4. Webhook received
5. Enrollment created
6. Course activated

Expected Results:

- Payment processed successfully
- Webhook received and processed
- Enrollment created automatically
- Course immediately accessible
- Payment recorded in database

- User notified
-

TC-INTEGRATION-003: Facilitator Attendance to Lesson Access

Priority: High

Type: Integration

Test Steps:

1. Learner enrolls in on-site course
2. Facilitator marks attendance
3. Learner attempts to access lesson
4. Learner completes lesson

Expected Results:

- Attendance recorded
 - Lesson unlocked immediately
 - Learner can access lesson
 - Progress tracked
 - Attendance visible to admin
-

TC-INTEGRATION-004: Admin Grant Extra Pause to Learner

Priority: High

Type: Integration

Test Steps:

1. Learner exhausts all pauses
2. 30-second auto-complete timer starts
3. Admin grants 3 extra pauses
4. Learner resumes lesson

Expected Results:

- Extra pauses granted immediately
 - Timer cancelled
 - Learner can pause again
 - Pause counter updated
 - Action logged
-

12. Accessibility Testing

TC-ACCESSIBILITY-001: Screen Reader Compatibility

Priority: Medium

Type: Accessibility

Test Steps:

1. Enable TalkBack (Android) or VoiceOver (iOS)
2. Navigate through app
3. Test all interactive elements

Expected Results:

- All buttons have labels
 - Images have alt text
 - Navigation announced correctly
 - Form fields labeled
 - Error messages read aloud
-

TC-ACCESSIBILITY-002: Color Contrast

Priority: Medium

Type: Accessibility

Test Steps:

1. Use color contrast checker

2. Test all text/background combinations
3. Verify WCAG AA compliance

Expected Results:

- Text contrast ratio $\geq 4.5:1$
- Large text contrast $\geq 3:1$
- Interactive elements

TC-FACILITATOR-004: View Attendance History

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Attendance" > "History"
2. Select course
3. View attendance records

Expected Results:

- All attendance records displayed
- Date and time shown
- Learner names listed
- Present/Absent status visible
- Export to CSV available

TC-FACILITATOR-005: Supervise Live Sessions

Priority: High

Type: Functional

Test Steps:

1. Navigate to "Sessions"

2. View active sessions
3. Monitor learner progress

Expected Results:

- Active sessions listed
 - Learner names shown
 - Current lesson displayed
 - Progress percentage visible
 - Real-time updates
-

TC-FACILITATOR-006: View Session Reports

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to "Reports"
2. Select date range
3. View session statistics

Expected Results:

- Total sessions count
 - Completion rate displayed
 - Average duration shown
 - Learner-wise breakdown
 - Export functionality available
-

TC-FACILITATOR-007: Export Attendance Report

Priority: Medium

Type: Functional

Test Steps:

1. Navigate to attendance
2. Select date range
3. Click "Export CSV"

Expected Results:

- CSV file downloads
 - All attendance data included
 - Proper formatting
 - File name includes date range
-

6. Security Testing

TC-SECURITY-001: SQL Injection Prevention

Priority: Critical

Type: Security

Test Steps:

1. Attempt SQL injection in login:
 - Email: `admin@test.com' OR '1='1`
 - Password: `anything`
2. Attempt in search fields
3. Attempt in course filters

Expected Results:

- All inputs sanitized
 - Parameterized queries used
 - No SQL errors exposed
 - Injection attempts logged
 - No unauthorized access
-

TC-SECURITY-002: XSS Prevention

Priority: Critical

Type: Security

Test Steps:

1. Attempt XSS in course title:
 - <script>alert('XSS')</script>
2. Attempt in user profile fields
3. Attempt in comments/descriptions

Expected Results:

- Scripts not executed
 - HTML entities escaped
 - Content sanitized
 - No JavaScript injection possible
-

TC-SECURITY-003: CSRF Protection

Priority: Critical

Type: Security

Test Steps:

1. Capture legitimate request
2. Replay request without CSRF token
3. Attempt cross-origin request

Expected Results:

- CSRF tokens required
 - Tokens validated on server
 - Invalid tokens rejected
 - 403 Forbidden response
-

TC-SECURITY-004: JWT Token Security

Priority: Critical

Type: Security

Test Steps:

1. Capture JWT token
2. Attempt to modify token payload
3. Attempt to use expired token
4. Attempt token without signature

Expected Results:

- Modified tokens rejected
 - Expired tokens rejected (401)
 - Unsigned tokens rejected
 - Token signature verified
 - Secret key not exposed
-

TC-SECURITY-005: Password Hashing

Priority: Critical

Type: Security

Test Steps:

1. Create user with password
2. Check database for password storage
3. Verify hashing algorithm

Expected Results:

- Passwords hashed with bcrypt
 - 12 salt rounds used
 - Plain text passwords never stored
 - Hash format: `$2b$12$...`
-

TC-SECURITY-006: Rate Limiting

Priority: High

Type: Security

Test Steps:

1. Make 100 requests in 1 minute (general)
2. Make 6 login attempts in 15 minutes
3. Make 4 registration attempts in 1 hour

Expected Results:

- General: 100 requests/15min limit enforced
 - Login: 5 attempts/15min limit enforced
 - Registration: 3 attempts/hour limit enforced
 - 429 Too Many Requests response
 - Retry-After header included
-

TC-SECURITY-007: CORS Policy

Priority: High

Type: Security

Test Steps:

1. Attempt API request from unauthorized origin
2. Check CORS headers
3. Verify allowed origins

Expected Results:

- Only whitelisted origins allowed
 - Credentials allowed for valid origins
 - Unauthorized origins blocked
 - CORS headers properly set
-

TC-SECURITY-008: Security Headers (Helmet)

Priority: High

Type: Security

Test Steps:

1. Make API request
2. Inspect response headers

Expected Results:

- Content-Security-Policy header present
 - X-Frame-Options: DENY
 - X-Content-Type-Options: nosniff
 - Strict-Transport-Security header
 - X-XSS-Protection header
-

TC-SECURITY-009: Audio File Encryption

Priority: Critical

Type: Security

Test Steps:

1. Download lesson for offline use
2. Locate audio file in device storage
3. Attempt to play file outside app
4. Inspect file format

Expected Results:

- File encrypted with AES-256-CBC
 - File not playable outside app
 - File extension: .enc or similar
 - No metadata exposed
 - Decryption only in-app
-

TC-SECURITY-010: Role-Based Access Control

Priority: Critical

Type: Security

Test Steps:

1. Login as learner
2. Attempt to access admin endpoints:
 - GET /api/admin/users
 - POST /api/admin/courses
3. Attempt to access facilitator endpoints

Expected Results:

- 403 Forbidden response
 - Role verified on every request
 - Middleware enforces permissions
 - No data leakage
-

TC-SECURITY-011: Sensitive Data Exposure

Priority: Critical

Type: Security

Test Steps:

1. Check API responses for sensitive data
2. Inspect error messages
3. Check logs for sensitive info

Expected Results:

- Passwords never in responses
 - Password reset tokens not exposed
 - Error messages generic
 - Stack traces not exposed in production
 - Logs don't contain passwords
-

TC-SECURITY-012: Input Validation

Priority: High

Type: Security

Test Steps:

1. Submit forms with invalid data:
 - Email: **notanemail**
 - Password: **123**
 - Phone: **abc**
2. Submit extremely long strings
3. Submit special characters

Expected Results:

- All inputs validated
 - Appropriate error messages
 - No server crashes
 - Length limits enforced
 - Type validation works
-

7. Performance Testing

TC-PERF-001: Page Load Time

Priority: High

Type: Performance

Test Steps:

1. Clear browser cache
2. Navigate to home page
3. Measure load time
4. Navigate to course detail page
5. Measure load time

Expected Results:

- Home page loads in < 3 seconds

- Course detail loads in < 2 seconds
 - Images lazy-loaded
 - No blocking resources
 - Lighthouse score > 80
-

TC-PERF-002: API Response Time

Priority: High

Type: Performance

Test Steps:

1. Make API requests:
 - GET /api/courses
 - GET /api/courses/:id
 - POST /api/auth/login
2. Measure response times

Expected Results:

- GET requests < 500ms
 - POST requests < 1000ms
 - Database queries optimized
 - Proper indexing used
-

TC-PERF-003: Audio Streaming Performance

Priority: High

Type: Performance

Test Steps:

1. Start lesson playback
2. Monitor audio buffering
3. Check memory usage
4. Test with slow network

Expected Results:

- Audio starts within 2 seconds
 - No buffering during playback
 - Memory usage < 100MB
 - Graceful degradation on slow network
-

TC-PERF-004: Concurrent Users Load Test

Priority: High

Type: Performance

Test Steps:

1. Simulate 100 concurrent users
2. All users login simultaneously
3. All users browse courses
4. Monitor server resources

Expected Results:

- Server handles 100 concurrent users
 - Response times remain acceptable
 - No timeouts
 - CPU usage < 80%
 - Memory usage stable
-

TC-PERF-005: Database Query Performance

Priority: Medium

Type: Performance

Test Steps:

1. Execute complex queries:
 - Course list with filters
 - User progress aggregation
 - Analytics queries
2. Measure execution time

Expected Results:

- All queries < 1 second
 - Proper indexes used
 - No N+1 query problems
 - Connection pooling works
-

TC-PERF-006: Large File Upload

Priority: Medium

Type: Performance

Test Steps:

1. Upload 100MB audio file
2. Monitor upload progress
3. Check server processing

Expected Results:

- Upload completes successfully
 - Progress indicator accurate
 - No timeout errors
 - File processed correctly
 - Encryption doesn't timeout
-

8. Device Compatibility

TC-DEVICE-001: Android Version Compatibility

Priority: High

Type: Compatibility

Test Devices:

- Android 7.0 (API 24)
- Android 10.0 (API 29)
- Android 13.0 (API 33)

Test Steps:

1. Install app on each device
2. Test core functionality
3. Test device-specific features

Expected Results:

- App installs on all versions
 - All features work correctly
 - UI renders properly
 - No crashes
 - Performance acceptable
-

TC-DEVICE-002: Screen Size Compatibility

Priority: High

Type: Compatibility

Test Devices:

- Small phone (5" screen)
- Medium phone (6" screen)
- Large phone (6.5" screen)
- Tablet (10" screen)

Test Steps:

1. Open app on each device
2. Navigate through all screens
3. Test UI elements

Expected Results:

- UI scales properly
- Text readable on all sizes

- Buttons accessible
 - No overlapping elements
 - Responsive design works
-

TC-DEVICE-003: Browser Compatibility (Web Panel)

Priority: High

Type: Compatibility

Test Browsers:

- Chrome (latest)
- Firefox (latest)
- Safari (latest)
- Edge (latest)

Test Steps:

1. Open admin panel in each browser
2. Test all functionality
3. Check UI rendering

Expected Results:

- All features work in all browsers
 - UI consistent across browsers
 - No JavaScript errors
 - CSS renders correctly
-

TC-DEVICE-004: Network Conditions

Priority: High

Type: Compatibility

Test Conditions:

- 4G connection

- 3G connection
- 2G connection
- WiFi connection

Test Steps:

1. Test app on each network type
2. Download lesson
3. Stream audio
4. Sync progress

Expected Results:

- App works on all network types
 - Downloads complete successfully
 - Appropriate loading indicators
 - Graceful error handling
 - Offline mode works
-

TC-DEVICE-005: Battery Impact

Priority: Medium

Type: Performance

Test Steps:

1. Start lesson playback
2. Monitor battery usage for 1 hour
3. Check wake lock behavior

Expected Results:

- Battery drain < 15% per hour
 - Wake lock released when paused
 - No background battery drain
 - Efficient resource usage
-

TC-DEVICE-006: Storage Management

Priority: Medium

Type: Functional

Test Steps:

1. Download 5 lessons (300MB total)
2. Check storage usage
3. Delete downloaded lessons
4. Verify storage freed

Expected Results:

- Storage usage accurate
 - Downloaded files stored efficiently
 - Deletion frees storage
 - No orphaned files
 - Storage warning when low
-

9. Offline Functionality

TC-OFFLINE-001: Download Lesson for Offline Use

Priority: High

Type: Functional

Test Steps:

1. Connect to WiFi
2. Navigate to course
3. Click download icon on lesson
4. Wait for download to complete
5. Disconnect from internet
6. Start lesson

Expected Results:

- Download starts immediately

- Progress indicator shown
 - Download completes successfully
 - "Downloaded" badge shown
 - Lesson playable offline
 - Audio encrypted during download
-

TC-OFFLINE-002: Offline Playback Enforcement

Priority: High

Type: Business Logic

Test Steps:

1. Download lesson
2. Enable airplane mode
3. Start lesson playback
4. Disable airplane mode during playback
5. Observe behavior

Expected Results:

- Lesson starts in offline mode
 - Playback pauses when network detected
 - Warning message displayed
 - Cannot resume until offline
 - Re-enabling airplane mode allows resume
-

TC-OFFLINE-003: Progress Sync After Offline Session

Priority: High

Type: Functional

Test Steps:

1. Complete lesson offline

2. Reconnect to internet
3. Wait for sync
4. Check progress on server

Expected Results:

- Progress syncs automatically
 - Completion status updated
 - Time spent recorded
 - Pause count synced
 - Next lesson unlocked
-

TC-OFFLINE-004: Multiple Lesson Downloads

Priority: Medium

Type: Functional

Test Steps:

1. Download 3 lessons simultaneously
2. Monitor download progress
3. Verify all downloads complete

Expected Results:

- Multiple downloads work
 - Progress shown for each
 - No conflicts
 - All files encrypted
 - Storage managed properly
-

TC-OFFLINE-005: Delete Downloaded Lesson

Priority: Medium

Type: Functional

Test Steps:

1. Download lesson
2. Click "Delete Download"
3. Confirm deletion
4. Verify storage freed

Expected Results:

- Confirmation dialog shown
 - Download deleted
 - Storage freed
 - "Download" button shown again
 - Lesson still accessible online
-

TC-OFFLINE-006: Offline Mode Without Download

Priority: High

Type: Negative Testing

Test Steps:

1. Do NOT download lesson
2. Enable airplane mode
3. Attempt to start lesson

Expected Results:

- Error message displayed
 - "Please download lesson first"
 - Download button shown
 - Cannot proceed without download
-

10. Edge Cases & Error Handling

TC-EDGE-001: Empty Course (No Lessons)

Priority: Medium

Type: Edge Case

Test Steps:

1. Create course without lessons
2. Enroll user in course
3. User views course detail

Expected Results:

- Course displays correctly
 - "No lessons available" message
 - No errors
 - Progress shows 0%
-

TC-EDGE-002: Extremely Long Text Input

Priority: Medium

Type: Edge Case

Test Steps:

1. Enter 10,000 character course description
2. Submit form

Expected Results:

- Validation error shown
 - Character limit enforced
 - No server error
 - Appropriate error message
-

TC-EDGE-003: Special Characters in Input

Priority: Medium

Type: Edge Case

Test Steps:

1. Enter special characters in fields:
 - Course title: Test™ Course® #1
 - Description: Émojis 😊 & symbols ©
2. Submit form

Expected Results:

- Special characters accepted
 - Properly encoded
 - Display correctly
 - No encoding issues
-

TC-EDGE-004: Network Interruption During Payment

Priority: High

Type: Edge Case

Test Steps:

1. Initiate payment
2. Disconnect network during payment
3. Reconnect network
4. Check payment status

Expected Results:

- Payment status verified via webhook
 - Enrollment created if payment successful
 - User notified of status
 - No duplicate charges
 - Graceful error handling
-

TC-EDGE-005: Simultaneous Login from Multiple Devices

Priority: Medium

Type: Edge Case

Test Steps:

1. Login on Device A
2. Login on Device B with same credentials
3. Perform actions on both devices

Expected Results:

- Both sessions valid
 - JWT tokens independent
 - No conflicts
 - Progress syncs correctly
-

TC-EDGE-006: Audio File Corruption

Priority: High

Type: Edge Case

Test Steps:

1. Upload corrupted audio file
2. Attempt to play lesson

Expected Results:

- Upload validation detects corruption
 - Error message shown
 - File rejected
 - No partial uploads
-

TC-EDGE-007: Expired JWT Token During Session

Priority: High

Type: Edge Case

Test Steps:

1. Login and get token
2. Wait for token expiration (7 days)
3. Attempt API request

Expected Results:

- 401 Unauthorized response
 - User redirected to login
 - Session data cleared
 - Appropriate error message
-

TC-EDGE-008: Database Connection Loss

Priority: Critical

Type: Edge Case

Test Steps:

1. Simulate database connection loss
2. Attempt API requests
3. Restore connection

Expected Results:

- Graceful error handling
 - 503 Service Unavailable response
 - No server crash
 - Connection retry logic works
 - Service resumes after restore
-

TC-EDGE-009: Lesson Completion at Exactly 100%

Priority: Medium

Type: Edge Case

Test Steps:

1. Play lesson to exactly 100% completion
2. Check completion status

Expected Results:

- Lesson marked as completed
 - Progress updated to 100%
 - Next lesson unlocked
 - Completion timestamp recorded
 - Certificate generated (if applicable)
-

TC-EDGE-010: Rapid Pause/Resume Clicks

Priority: Medium

Type: Edge Case

Test Steps:

1. Start lesson playback
2. Rapidly click pause/resume 10 times
3. Observe behavior

Expected Results:

- No crashes
 - Pause counter accurate
 - Audio state consistent
 - No race conditions
 - UI updates correctly
-

Test Execution Summary

Test Coverage Matrix

Module	Total Tests	Priority High	Priority Medium	Priority Low
Authentication	7	6	1	0
Public Pages	5	1	4	0
Learner App	24	18	6	0
Admin Panel	32	24	8	0
Facilitator Panel	7	4	3	0
Security	12	12	0	0
Performance	6	4	2	0
Device Compatibility	6	4	2	0
Offline Functionality	6	5	1	0
Edge Cases	10	5	5	0
TOTAL	115	83	32	0

Test Environment Requirements

Hardware Requirements

- **Mobile Device:** Android 7.0+ (API 24+)
- **RAM:** Minimum 2GB
- **Storage:** Minimum 500MB free space
- **Network:** WiFi or 4G connection

Software Requirements

- **Backend:** Node.js 16+, PostgreSQL 13+
- **Frontend:** React 18+, Vite
- **Mobile:** Capacitor 5+
- **Browser:** Chrome 90+, Firefox 88+, Safari 14+

Test Data Requirements

- 3 test user accounts (Admin, Facilitator, Learner)
 - 5 test courses (2 self-paced, 3 on-site)
 - 15 test lessons with audio files
 - Razorpay test credentials
 - Sample audio files (MP3, 60-70 minutes each)
-

Test Execution Guidelines

Priority Levels

- **High Priority:** Must pass before production deployment
- **Medium Priority:** Should pass, can be fixed in patch release
- **Low Priority:** Nice to have, can be deferred

Test Execution Order

1. Security tests (TC-SECURITY-*)
2. Authentication tests (TC-AUTH-*)
3. Core functionality tests (TC-LEARNER-, TC-ADMIN-)
4. Integration tests (Payment, Attendance)
5. Performance tests (TC-PERF-*)
6. Compatibility tests (TC-DEVICE-*)
7. Edge case tests (TC-EDGE-*)

Pass/Fail Criteria

- **Pass:** All expected results achieved, no critical bugs
 - **Fail:** Any expected result not achieved, critical bug found
 - **Blocked:** Cannot execute due to dependency failure
 - **Skip:** Not applicable for current test cycle
-

Bug Severity Classification

Critical (P0)

- Security vulnerabilities
- Data loss or corruption
- Complete feature failure
- App crashes

High (P1)

- Major feature not working
- Incorrect business logic
- Performance degradation
- Payment issues

Medium (P2)

- Minor feature issues
- UI/UX problems
- Non-critical errors
- Workaround available

Low (P3)

- Cosmetic issues
 - Minor UI inconsistencies
 - Enhancement requests
 - Documentation errors
-

Test Reporting

Daily Test Report

- Tests executed: X/115
- Tests passed: X
- Tests failed: X
- Tests blocked: X
- Bugs found: X (P0: X, P1: X, P2: X, P3: X)

Final Test Report

- Overall pass rate: X%
 - Critical bugs: 0 (must be 0 for production)
 - High priority bugs: < 5
 - Test coverage: > 95%
 - Recommendation: Go/No-Go for production
-

Appendix

Test Tools

- **API Testing:** Postman, Thunder Client
- **Load Testing:** Apache JMeter, k6
- **Security Testing:** OWASP ZAP, Burp Suite
- **Mobile Testing:** Android Studio Emulator, Real devices
- **Browser Testing:** BrowserStack, LambdaTest
- **Performance Monitoring:** Lighthouse, WebPageTest

Reference Documents

- Requirements Audit: [REQUIREMENTS_AUDIT.md](#)
 - Security Audit: [SECURITY_AUDIT_FIXES.md](#)
 - API Documentation: Backend README
 - User Manual: Client README
-

Document Version: 1.0

Last Updated: January 12, 2026

Prepared By: QA Team

Status: Ready for Test Execution

END OF TEST CASES DOCUMENT