Software Requirements Specification (SRS)

AAK Academy Management System
Academic and Administrative Automation Platform

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Contents

1 Introduction

1.1 Purpose

1.1.1 Overview of the Document

This Software Requirements Specification (SRS) document provides a comprehensive description of the AAK Academy Management System. The document serves as the primary reference for all stakeholders involved in the development, testing, and deployment phases of the project. It establishes a clear understanding of the system's functionalities, constraints, and quality attributes, ensuring alignment between technical teams and the requirement provider.

1.1.2 Purpose of the SRS

The purpose of this SRS document is to:

- Define all functional and non-functional requirements for the AAK Academy Management System in detail

- Serve as a baseline for project planning, design, implementation, and validation activities

- Provide clear specifications for quality assurance teams to develop comprehensive test cases

- Enable future maintenance teams to understand system architecture and design decisions

- Document assumptions, dependencies, and constraints that influence system development

1.1.3 Intended Audience

This document addresses the needs of multiple stakeholder groups:
Development Team

- Software Engineers: To implement features according to specified requirements

- System Architects: To design scalable and maintainable system architecture

- UI/UX Designers: To create intuitive interfaces aligned with user needs

- Database Administrators: To design efficient data storage and retrieval mechanisms

Quality Assurance Team

- QA Engineers: To develop test cases and validation strategies

- Testing Specialists: To ensure system meets all specified requirements

Project Management

- Project Managers: To plan resources, timelines, and deliverables

- Requirement Provider (Mr. Ammar Ahmad Khan): To validate that requirements are correctly captured

End Users

- Students: Matric and Intermediate level students using the platform for academic purposes

- Teachers: Faculty members managing courses, assignments, and assessments

- Administrators: Academy staff members managing system operations and data

1.2   Scope

1.2.1   Product Identification

AAK Academy Management System is a web-based platform designed to automate academic and administrative operations for AAK Academy, which offers Matric and Intermediate level programs. The system provides a comprehensive solution for student enrollment, subject selection, fee management, assignment distribution, quiz administration, and performance tracking.

1.2.2   Product Features

What AAK Academy Management System Will Do:

- Provide automated student registration and profile management

- Enable subject selection with automatic fee calculation and discount application

- Support teachers in creating, distributing, and grading assignments and quizzes

- Offer comprehensive administrative controls for managing students, teachers, subjects, and classes

- Implement automated discount policies (10% for 3 subjects, 20% for 6 subjects)

- Provide faculty information pages showcasing teacher profiles and qualifications

- Generate academic reports and performance analytics

- Support live class integration via Zoom with attendance tracking

- Implement secure payment processing for fee collection

- Offer role-based dashboards for students, teachers, and administrators

What AAK Academy Management System Will Not Do (Initial Release):

- Include artificial intelligence-based grading or recommendations

- Support multiple languages (English only in initial release)

- Integrate with external school management systems

- Provide real-time video conferencing (uses Zoom integration)

- Include parent portals or parental controls

- Support offline functionality

- Offer social networking features between students

1.2.3 Application of the Software

AAK Academy Management System addresses critical gaps in academy operations by providing:

- **Operational Efficiency:** Automates manual processes reducing administrative workload

- **Financial Accuracy:** Eliminates errors in fee calculation and discount application

- **Academic Transparency:** Provides clear tracking of assignments, quizzes, and results

- **Accessibility:** Enables 24/7 access to academic materials and information

- **Communication Improvement:** Streamlines interaction between students, teachers, and administrators

- **Data Management:** Centralizes academic and administrative data for better decision making

1.2.4 Goals and Benefits

- **Automation:** Reduce manual work by 70% through process automation

- **Accuracy:** Minimize errors in fee calculation, grade recording, and data management

- **Accessibility:** Provide anytime, anywhere access to academic resources

- **Transparency:** Improve visibility into academic progress and administrative processes

- **Efficiency:** Streamline operations saving time for teachers and administrators

- **Data-Driven Decisions:** Enable analytics-based improvements in teaching and administration

- **Cost Reduction:** Decrease administrative costs through digital transformation

1.3 Overview

1.3.1 Document Structure

This SRS document follows the IEEE 830 standard and is organized into the following major sections:

1. Introduction: Provides document purpose, scope, definitions, and overview

2. Overall Description: Describes product perspective, user characteristics, constraints, and assumptions

3. Specific Requirements: Details functional requirements, interface specifications, and system features

4. System Features: Enumerates core features with detailed descriptions

5. External Interface Requirements: Specifies user, hardware, software, and communication interfaces

6. Non-Functional Requirements: Covers performance, security, reliability, and usability requirements

7. Other Requirements: Addresses legal, regulatory, and operational considerations

8. Appendices: Contains supplementary materials including diagrams, glossary, and references

1.3.2 Organization of the Document

Each section builds upon previous sections to provide progressively detailed specifications:

- Sections are numbered hierarchically for easy reference and navigation

- Cross-references link related requirements and specifications

- Technical terms are defined in the glossary to ensure consistent understanding

- Diagrams and tables supplement textual descriptions for clarity

- Requirements are uniquely identified with tags (e.g., FR-001, NFR-001) for traceability

1.4   Definitions, Acronyms, and Abbreviations

Term/Acronym	Definition
AAK Academy	Ammar Ahmad Khan Academy - The educational institution using the system
SRS	Software Requirements Specification - a document describing system requirements
RP	Requirement Provider - Mr. Ammar Ahmad Khan, the stakeholder defining system requirements
Matric	Secondary School Certificate (9th-10th grade) program offered by the academy
Intermediate	Higher Secondary School Certificate (11th-12th grade) program
UI/UX	User Interface/User Experience - design aspects affecting user interaction with the system
Admin	Administrator - privileged user with system management capabilities
Student	Regular user enrolled in Matric or Intermediate programs
Teacher	Faculty member responsible for course delivery and assessment
LMS	Learning Management System - platform for delivering educational content
IEEE 830	IEEE Recommended Practice for Software Requirements Specifications standard
HTTPS	Hypertext Transfer Protocol Secure - encrypted communication protocol
DBMS	Database Management System - software for managing structured data
HTML5	HyperText Markup Language version 5 - standard for web content structure
CSS3	Cascading Style Sheets version 3 - stylesheet language for web presentation
JavaScript	Programming language for interactive web functionality
Responsive Design	Design approach ensuring optimal display across various device screen sizes
Session Management	System mechanism for tracking authenticated user interactions
CRUD Operations	Create, Read, Update, Delete - fundamental data manipulation operations
MVP	Minimum Viable Product - initial version with core features
GPA	Grade Point Average - numerical representation of academic performance
API	Application Programming Interface - set of protocols for building software
Zoom	Video conferencing platform integrated for live classes

1.5   References

1.5.1   Standards

1. IEEE Std 830-1998: IEEE Recommended Practice for Software Requirements Specifications

2. IEEE Std 1012-2016: IEEE Standard for System, Software, and Hardware Verification and Validation

1.5.2   Technical Documentation

1. HTML5 Specification: `https://html.spec.whatwg.org/`

2. CSS3 Standards: `https://www.w3.org/Style/CSS/`

3. JavaScript ES6+ Documentation: `https://developer.mozilla.org/en-US/docs/Web/JavaScript`

4. MySQL Documentation: `https://dev.mysql.com/doc/`

1.5.3   Project Documentation

1. AAK Academy Project Proposal (Milestone 1)

2. Requirement Provider Agreement

3. Meeting Minutes with Requirement Provider

4. Project GitHub Repository: `https://github.com/`

1.5.4   Development Tools

1. Visual Studio Code: `https://code.visualstudio.com`

2. Git Version Control: `https://git-scm.com`

3. XAMPP/WAMP: Local development environment

4. Draw.io: Diagram creation tool

2 Overall Description

2.1 Product Perspective

AAK Academy Management System is an independent web-based platform designed to modernize academic and administrative operations of AAK Academy. Unlike generic school management systems, it is specifically tailored for Matric and Intermediate programs with automated discount calculations and integrated academic tools.

2.1.1 System Context

The system operates as a standalone platform with the following contextual relationships:

Relationship with Traditional Academy Operations AAK Academy Management System serves as a digital transformation tool replacing manual processes:

- Replaces paper-based enrollment and registration processes

- Automates fee calculation and discount application

- Digitizes assignment distribution and submission

- Provides online quiz creation and grading

- Centralizes academic records and performance data

Integration Possibilities While initially standalone, the architecture allows future integration with:

- Payment gateways for online fee collection

- Zoom API for live class integration

2.1.2 System Interfaces

The system comprises several interconnected components:

User Interface Layer

- Web browser-based interface supporting modern browsers (Chrome, Firefox, Safari, Edge)

- Responsive design adapting to desktop, tablet, and mobile screen sizes

- Three distinct interfaces for Students, Teachers, and Administrators

- Intuitive navigation structure with role-based dashboards

Application Layer

- Business logic for user authentication and authorization selection and fee calculation engine

- Assignment and quiz management module

- Performance tracking and analytics module

- Content management system for administrators

- Report generation module

Data Layer

- Relational database storing user profiles, academic data, financial records, and content

- File storage system for assignment submissions and learning materials

- Session management for maintaining user state

- Backup and recovery systems

External Interfaces

- Zoom API integration for live classes

- Payment gateway integration for fee collection

2.1.3   User Classes and Characteristics

The system defines three primary user classes with distinct characteristics and access levels:

Student (Regular User)

- **Primary Goal:** Access academic materials, submit assignments, attempt quizzes, track performance

- **Technical Proficiency:** Basic to intermediate computer literacy

- **Usage Frequency:** Daily during academic sessions

- **Educational Background:** Secondary school education

- **Access Requirements:** Active enrollment in academy programs

- **Key Features Used:** Dashboard, subject selection, assignment submission, quiz attempts, grade viewing

Teacher (Faculty User)

- **Primary Goal:** Manage courses, create assessments, grade submissions, track student progress

- **Technical Proficiency:** Intermediate computer literacy

- **Responsibilities:** Course delivery, assessment creation, student evaluation, feedback provision

- **Usage Pattern:** Daily during teaching periods

- **Subject Expertise:** Specialized knowledge in specific subjects

- **Access Requirements:** Faculty credentials with subject assignments

- **Key Features Used:** Course management, assignment creation, quiz administration, grading tools, student analytics

Administrator

- **Primary Goal:** Manage system operations, users, academic programs, and financial aspects

- **Technical Proficiency:** Intermediate to advanced computer literacy

- **Responsibilities:** User management, system configuration, report generation, financial oversight

- **Usage Pattern:** Daily monitoring with periodic administrative tasks

- **Access Requirements:** Pre-configured credentials with elevated privileges

- **Key Features Used:** User management, subject management, class scheduling, fee management, report generation, system settings

2.2 Product Functions

The core functions of AAK Academy Management System are organized into four major functional areas:

2.2.1 Student Management Functions

- **Registration and Enrollment:** New student registration with profile creation

- **Subject Selection:** Course selection with automatic fee calculation

- **Discount Application:** Automatic discount calculation based on subject count

- **Academic Access:** Access to learning materials, assignments, and quizzes

- **Performance Tracking:** Grade viewing and progress monitoring

- **Profile Management:** Personal information updates and password management

2.2.2 Teacher Management Functions

- **Course Assignment:** Subject and class allocation to teachers

- **Content Management:** Uploading learning materials and resources

- **Assessment Creation:** Designing assignments and quizzes with various question types

- **Grading System:** Online grading with feedback provision

- **Student Monitoring:** Tracking student participation and performance

- **Communication Tools:** Announcing deadlines and important information

2.2.3   Administrative Management Functions

- **Class Scheduling:** Timetable creation and management

- **Attendance Tracking:** Monitoring student and teacher attendance

- **User Management:** Comprehensive control over all user accounts

- **Grade Management:** Setting up grading scales and evaluation criteria

- **Attendance Tracking:** Monitoring student and teacher attendance

- **System Configuration:** Setting up academic sessions, terms, and policies

- **Financial Management:** Fee collection tracking and financial reporting

- **Report Generation:** Academic, financial, and operational reports

- **Backup and Recovery:** System data backup and restoration

- **Security Management:** Access control and security configuration

2.2.4   Specialized Functions

- **Automated Discount System:**

  - 10% discount automatically applied when selecting 3 subjects
  - 20% discount automatically applied when selecting 6 subjects
  - Real-time fee calculation during subject selection

- **Live Class Integration:**

  - Zoom integration for virtual classrooms
  - Automatic attendance marking
  - Recorded session storage and access

2.3   User Characteristics

2.3.1   Educational Level and Background

AAK Academy Management System targets users with diverse educational backgrounds:
Student Users

- **Education Level:** Matric (9th-10th grade) or Intermediate (11th-12th grade)

- **Computer Literacy:** Basic proficiency with web browsers and digital interfaces

- **Language Proficiency:** English and Urdu comprehension

- **Academic Focus:** Science, Arts, or Commerce streams

Teacher Users

- **Education Level:** Bachelor's degree or higher in relevant subjects

- **Teaching Experience:** Varies from novice to experienced educators

- **Technical Skills:** Moderate proficiency with educational technology

- **Subject Expertise:** Specialized knowledge in teaching subjects

Administrator Users

- **Education Level:** Bachelor's degree in administration or related fields

- **Administrative Experience:** Experience in educational administration

- **Technical Skills:** Good proficiency with management systems

- **Management Capabilities:** Experience in team and resource management

2.3.2   Technical Proficiency

Student Technical Requirements

- Ability to navigate web browsers and fill online forms

- Understanding of basic web interactions (clicking, scrolling, form submission)

- File upload/download capabilities for assignments

- Email access for account notifications and password recovery

- No programming or advanced technical knowledge required

Teacher Technical Requirements

- Moderate computer skills including file management

- Understanding of content upload and management

- Ability to use online assessment tools

- Basic troubleshooting skills for technical issues

- Experience with video conferencing tools (Zoom)

Administrator Technical Requirements

- Intermediate computer skills including system administration

- Understanding of database concepts and reporting

- Ability to configure system settings and policies

- Experience with user management and access control

- Basic knowledge of network and security concepts

2.3.3   Accessibility Considerations

The platform incorporates inclusive design principles:

- High contrast text for visual clarity

- Keyboard navigation support for users with mobility constraints for text resizing without breaking layout

- Clear language avoiding unnecessary jargon

- Consistent navigation patterns across all interfaces

- Alternative text for images and graphical elements

2.3.4   Software Interface Constraints

Technology Stack Limitations

- Development constrained to open-source technologies to minimize licensing costs

- Framework selection influenced by team expertise and available documentation

- Database choice limited by hosting environment capabilities

- Integration with Zoom API for live classes

- Payment gateway integration constraints based on available options

Authentication Constraints

- Email verification dependent on email server reliability

- Password recovery mechanisms limited to email-based reset

- No integration with external identity providers in initial release

- Session management constrained by server resources

Integration Constraints

- Zoom API integration subject to Zoom's terms and rate limits

- Payment gateway integration dependent on third-party availability

2.3.5   Design and Implementation Constraints

Development Timeline

- Project must be completed within academic semester timeline

- Milestone deadlines impose incremental delivery requirements

- Testing and refinement time limited by project schedule

- Academic calendar constraints for feature deployment

3   Specific Requirements

This section provides detailed specifications for all functional and interface requirements of the AAK Academy Management System. Each requirement is uniquely identified and described with sufficient detail for design and implementation.

3.1   Functional Requirements

3.1.1   User Authentication and Authorization

FR-001: Student Registration

- **Description:** The system shall allow new students to create accounts through a registration form

- **Inputs:** Full name, father's name, date of birth, gender, contact number, email address, address, previous academic details, program selection (Matric/Intermediate), password, confirm password

- **Process:**

    1. Student accesses registration page
    2. Student fills mandatory fields with validation checks
    3. System validates email format, password strength, and age requirements
    4. System creates account in "Pending Verification" status
    5. System sends confirmation email to student
    6. Administrator receives notification of new registration

- **Outputs:** Account created with pending status, email notifications sent, registration ID generated

- **Validation Rules:**

    - Email must be unique in system
    - Password minimum 8 characters with alphanumeric combination
    - Contact number must be valid format
    - Age must be appropriate for selected program
    - All mandatory fields must be completed

- **Priority:** High

FR-002: Teacher Registration

- **Description:** The system shall allow teachers to create faculty accounts

- **Inputs:** Teacher name, qualifications, experience, specialization subjects, contact information, email, temporary password

- **Process:**

1. Teacher accesses faculty management section
2. Teacher fills faculty registration form
3. System creates faculty account with "Active" status
4. System sends account details to teacher's email
5. Teacher receives credentials for first login

- **Outputs:** Teacher account created, credentials emailed, subject assignments recorded

- **Priority:** High

FR-003: User Login

- **Description:** The system shall authenticate users based on their role (Student/Teacher/Admin)

- **Inputs:** Email/Username, password, user type selection

- **Process:**

  1. User enters credentials on appropriate login page
  2. System verifies credentials against database
  3. System checks account status and role
  4. If valid, system creates user session and redirects to role-specific dashboard
  5. If account pending, system displays appropriate message
  6. If credentials invalid, system displays error message

- **Outputs:** Authenticated session created, appropriate dashboard displayed

- **Security:** Failed login attempts tracked, account locked after 5 consecutive failures

- **Priority:** High

FR-004: Role-Based Access Control

- **Description:** The system shall enforce role-based permissions for all system functions

- **Roles and Permissions:**

  - **Student:** Access to personal dashboard, subject selection, assignments, quizzes, grades
  - **Teacher:** Access to assigned courses, student management, assessment creation, grading
  - **Admin:** Full system access including user management, configuration, reports

- **Process:** System checks user role before granting access to any function or page

- **Priority:** High

FR-005: Password Management

- **Description:** The system shall provide comprehensive password management features

- **Features:**

  - Password change with current password verification
  - Password reset via email verification
  - Password strength enforcement (minimum 8 characters, mixed case, numbers)

- **Priority:** Medium

FR-006: Session Management

- **Description:** The system shall maintain secure user sessions with appropriate timeouts

- **Parameters:**

  - Session timeout after 30 minutes of inactivity for students
  - Session timeout after 60 minutes of inactivity for teachers
  - Session timeout after 120 minutes of inactivity for administrators
  - Warning displayed 5 minutes before timeout
  - Automatic logout on browser close
  - Single session per user (prevents multiple concurrent logins)

- **Priority:** Medium

3.1.2 Student Module Requirements

FR-007: Student Dashboard

- **Description:** The system shall provide personalized dashboard for each student

- **Components:**

  - Personal information summary
  - Current enrolled subjects with progress indicators
  - Upcoming assignments and quizzes with deadlines
  - Recent grades and performance summary
  - Notifications for important announcements
  - Quick access to key functions
  - Academic calendar view

- **Priority:** High

FR-008: Subject Selection with Automatic Fee Calculation

- **Description:** The system shall allow students to select subjects with real-time fee calculation

- **Process:**

  1. Student accesses subject selection page
  2. System displays available subjects for selected program
  3. Student selects subjects (minimum 3, maximum 7 for Matric; minimum 3, maximum 6 for Intermediate)
  4. System calculates total fee in real-time
  5. System applies automatic discounts:
     - 10% discount if 3 subjects selected
     - 20% discount if 6 subjects selected
  6. Student confirms selection
  7. System generates fee invoice

- **Outputs:** Subject selection confirmation, fee calculation details, invoice generation

- **Priority:** High

FR-009: Learning Materials Access

- **Description:** The system shall provide access to course materials for enrolled subjects

- **Materials Types:**

  - Lecture notes and presentations
  - Reference books and readings
  - Video lectures and tutorials
  - Practice exercises and worksheets
  - Past papers and solutions

- **Features:**

  - Organized by subject and topic
  - Download and offline access options
  - Search functionality within materials
  - Progress tracking for completed materials

- **Priority:** High

FR-010: Assignment Management

- **Description:** The system shall manage assignment submission and tracking

- **Student Features:**

  - View assigned assignments with deadlines
  - Download assignment instructions and resources
  - Upload completed assignments (multiple file formats supported)

- View submission status and confirmation
- Receive notifications for upcoming deadlines
- View graded assignments with teacher feedback

- **Priority:** High

FR-011: Online Quiz System

- **Description:** The system shall provide online quiz taking capability

- **Features:**

  - View available quizzes with time limits
  - Attempt quizzes with various question types (MCQs, true/false, short answer)
  - Timer display during quiz attempt
  - Auto-submission when time expires
  - Immediate score display for objective questions
  - Quiz attempt history and performance analysis

- **Priority:** High

FR-012: Grade and Performance Tracking

- **Description:** The system shall provide comprehensive grade tracking and performance analysis

- **Features:**

  - View grades for assignments, quizzes, and exams
  - Subject-wise performance breakdown
  - Progress graphs and charts
  - Comparison with class averages
  - GPA calculation and tracking
  - Academic standing and recommendations

- **Priority:** High

FR-013: Live Class Participation

- **Description:** The system shall integrate with Zoom for live classes

- **Features:**

  - View scheduled live classes for enrolled subjects
  - Join Zoom meetings with one-click access
  - Automatic attendance marking based on participation
  - Access to recorded class sessions
  - Class materials and resources linked to sessions

- **Priority:** Medium

FR-014: Fee Payment and Tracking

- **Description:** The system shall manage fee payment and tracking

- **Features:**

  - View fee structure and payment schedule
  - Check payment status and history
  - Download fee receipts and invoices
  - View applied discounts and adjustments
  - Payment reminders and due date notifications

- **Priority:** High

3.1.3 Teacher Module Requirements

FR-015: Teacher Dashboard

- **Description:** The system shall provide comprehensive dashboard for teachers

- **Components:**

  - Assigned subjects and classes overview
  - Student enrollment statistics
  - Upcoming assignments to grade
  - Recent student performance alerts
  - Quick access to teaching tools
  - Announcement posting capability

- **Priority:** High

FR-016: Course Content Management

- **Description:** The system shall allow teachers to manage course content

- **Features:**

  - Upload and organize learning materials
  - Create and manage course modules
  - Schedule content releases based on academic calendar
  - Version control for content updates
  - Content usage analytics

- **Priority:** High

FR-017: Assignment Creation and Management

- **Description:** The system shall allow teachers to create and manage assignments

- **Features:**
  - Create assignments with detailed instructions
  - Set submission deadlines and late submission policies
  - Attach supporting files and resources
  - Assign to specific classes or students
  - Track submission status and send reminders
  - Download all submissions in batch

- **Priority:** High

FR-018: Online Quiz Creation

- **Description:** The system shall allow teachers to create online quizzes

- **Question Types Supported:**
  - Multiple Choice Questions (single and multiple correct)
  - True/False questions
  - Short answer questions
  - Essay-type questions
  - Matching questions
  - Fill in the blanks

- **Features:**
  - Question bank management
  - Random question selection for different students
  - Time limits and availability windows
  - Automatic grading for objective questions
  - Performance analytics for each question

- **Priority:** High

FR-019: Grading and Evaluation

- **Description:** The system shall provide comprehensive grading tools

- **Features:**
  - Grade assignments with rubric-based scoring
  - Provide detailed feedback comments
  - Grade quizzes (manual grading for subjective questions)
  - Calculate and assign final grades
  - Grade distribution analysis
  - Export grades to standard formats

- **Priority:** High

FR-020: Student Performance Monitoring

- **Description:** The system shall allow teachers to monitor student performance

- **Features:**

  - View individual student profiles and progress
  - Track assignment submission patterns
  - Monitor quiz and exam performance
  - Identify at-risk students based on performance
  - Generate performance reports for parents/administrators
  - Compare performance across different sections

- **Priority:** Medium

FR-021: Live Class Management

- **Description:** The system shall allow teachers to manage live classes

- **Features:**

  - Schedule Zoom meetings for classes
  - Generate and share meeting links
  - Take attendance from Zoom participants
  - Upload recorded sessions
  - Track student participation and engagement

- **Priority:** Medium

FR-022: Communication Tools

- **Description:** The system shall provide communication tools for teachers

- **Features:**

  - Send announcements to students
  - Individual and group messaging
  - Discussion forums for each subject
  - Notification system for important updates
  - Parent communication interface (if implemented)

- **Priority:** Medium

3.1.4 Administrator Module Requirements

FR-023: Admin Dashboard

- **Description:** The system shall provide comprehensive admin dashboard

- **Components:**

  - System overview and health metrics
  - User statistics (total students, teachers, active users)
  - Academic statistics (enrollments, subject selections)
  - Financial overview (fee collection, outstanding amounts)
  - Recent system activities and alerts
  - Quick action buttons for common tasks

- **Priority:** High

FR-024: Student Management

- **Description:** The system shall provide complete student management capabilities

- **Features:**

  - View and search all student records
  - Approve/reject new student registrations
  - Update student information and status
  - Manage student enrollments and subject selections
  - Track student academic progress
  - Generate student ID cards and certificates
  - Export student data to various formats

- **Priority:** High

FR-025: Teacher Management

- **Description:** The system shall provide complete teacher management capabilities

- **Features:**

  - Create and manage teacher accounts
  - Assign subjects and classes to teachers
  - Track teacher workload and assignments
  - Monitor teacher performance and student feedback
  - Manage teacher schedules and availability
  - Generate teacher contracts and documents

- **Priority:** High

FR-026: Academic Program Management

- **Description:** The system shall allow management of academic programs

- **Features:**

  - Create and manage Matric and Intermediate programs
  - Set credit hours and course requirements
  - Configure academic calendar and terms
  - Manage class schedules and timetables
  - Set grading scales and evaluation criteria

- **Priority:** High

FR-027: Subject and Course Management

- **Description:** The system shall allow management of subjects and courses

- **Features:**

  - Create and update subject details
  - Define subject prerequisites and co-requisites
  - Set subject fees and credit values
  - Assign teachers to subjects
  - Track subject enrollment statistics
  - Manage course content and materials

- **Priority:** High

FR-028: Fee Management

- **Description:** The system shall provide comprehensive fee management

- **Features:**

  - Define fee structures for programs and subjects
  - Configure discount policies and rules
  - Generate and manage fee invoices
  - Track fee payments and outstanding amounts
  - Process refunds and adjustments
  - Generate financial reports and statements

- **Priority:** High

FR-029: Automated Discount System

- **Description:** The system shall implement automated discount calculations

- **Discount Rules:**

  - 10% discount automatically applied when student selects 3 subjects

- 20% discount automatically applied when student selects 6 subjects

- Discounts calculated based on base fee before any other adjustments

- Discount application visible during subject selection process

- Discount details included in fee invoices and receipts

- **Configuration:** Admin can modify discount percentages and thresholds

- **Priority:** High

FR-030: Report Generation

- **Description:** The system shall generate various academic and administrative reports

- **Report Types:**

  - Student enrollment reports

  - Academic performance reports

  - Teacher workload reports

  - Financial reports and statements

  - Attendance and participation reports

  - System usage and activity reports

- **Features:**

  - Customizable report parameters and filters

  - Export to PDF, Excel, and CSV formats

  - Scheduled report generation and distribution

  - Report templates and customization

- **Priority:** Medium

FR-031: Faculty Information Page Management

- **Description:** The system shall allow management of faculty information pages

- **Features:**

  - Create and update teacher profiles for public viewing

  - Display teacher qualifications, experience, and expertise

  - Showcase achievements and certifications

  - Include contact information and availability

  - Organize faculty by subject and department

  - Allow teachers to update certain profile information

- **Priority:** Medium

FR-032: System Configuration and Settings

- **Description:** The system shall provide comprehensive configuration options

- **Configurable Settings:**

  - Academic session and term settings
  - Grading scales and evaluation criteria
  - Attendance policies and requirements
  - Notification and alert settings
  - System security and access controls
  - Integration settings (Zoom, payment gateways)

- **Priority:** Medium

FR-033: Backup and Recovery Management

- **Description:** The system shall provide data backup and recovery capabilities

- **Features:**

  - Schedule automatic database backups
  - Manual backup initiation option
  - Backup storage management
  - Data recovery and restoration procedures
  - Backup integrity verification
  - Export/import functionality for data migration

- **Priority:** Medium

3.1.5   System-Wide Requirements

FR-034: Notification System

- **Description:** The system shall provide comprehensive notification capabilities

- **Notification Types:**

  - Email notifications for important events
  - In-system notifications and alerts
  - Deadline reminders and warnings
  - System announcements and updates

- **Features:**

  - Customizable notification preferences
  - Notification history and tracking
  - Notification templates

- **Priority:** Medium

FR-035: Search Functionality

- **Description:** The system shall provide comprehensive search capabilities

- **Searchable Entities:**

  - Students by name, ID, or other attributes
  - Teachers by name, subject, or qualifications
  - Courses and subjects
  - Learning materials and resources
  - Assignments and quizzes
  - Notifications and announcements

- **Features:**

  - Advanced search with multiple criteria
  - Search results filtering and sorting
  - Quick search from any page
  - Search history and saved searches

- **Priority:** Medium

FR-036: Audit Trail and Logging

- **Description:** The system shall maintain comprehensive activity logs

- **Logged Activities:**

  - User login and logout events
  - Data creation, modification, and deletion
  - Grade changes and academic updates
  - Financial transactions and fee adjustments
  - System configuration changes
  - Security-related events

- **Features:**

  - Detailed timestamp and user information
  - Exportable log files
  - Search and filter capabilities
  - Automated log rotation and archiving

- **Priority:** Low

3.2 External Interface Requirements

3.2.1 User Interface Requirements

UI-001: General UI Principles

- **Design Philosophy:** Clean, professional, education-focused interface

- **Color Scheme:** Academic colors (blues, greens, neutrals) with high contrast for readability

- **Typography:** Clear, readable fonts; minimum 12pt for body text on desktop, 14pt on mobile

- **Responsiveness:** Fully responsive design supporting:

  - Desktop: 1920x1080 to 1366x768
  - Tablet: 1024x768 to 768x1024
  - Mobile: 375x667 to 414x896

- **Navigation:** Consistent navigation patterns across all user roles

- **Loading States:** Clear loading indicators for all operations

- **Feedback:** Immediate visual feedback for all user actions

UI-002: Student Interface Design

- **Layout:** Dashboard-centric design with quick access to key functions

- **Components:**

  - Header with logo, user profile, and notifications
  - Sidebar navigation for academic sections
  - Main content area with cards and widgets
  - Footer with academy information and links

- **Key Pages:**

  - Dashboard with academic overview
  - Subject selection with visual progress
  - Assignment submission with drag-and-drop
  - Quiz interface with clear timer and navigation
  - Grade viewing with visualizations

- **Visual Style:** Youthful but professional, with clear icons and visuals

UI-003: Teacher Interface Design

- **Layout:** Task-oriented design with emphasis on productivity

- **Components:**

  – Header with quick action buttons

  – Multi-level navigation for courses and classes

  – Workspace area with tabbed interfaces

  – Right sidebar for notifications and quick tools

- **Key Pages:**

  – Course management with drag-and-drop organization

  – Assignment creation with rich text editor

  – Quiz builder with question bank interface

  – Grading interface with rubrics and feedback

  – Analytics dashboard with charts and reports

- **Visual Style:** Professional and efficient, with data visualization elements

UI-004: Admin Interface Design

- **Layout:** Dashboard with comprehensive overview and management tools

- **Components:**

  – Top navigation with system-wide controls

  – Left sidebar with management sections

  – Main content area with data tables and forms

  – Right panel with quick stats and alerts

- **Key Pages:**

  – User management with bulk operations

  – Academic configuration with visual workflows

  – Financial management with transaction views

  – Report generation with parameter controls

  – System settings with categorization

- **Visual Style:** Professional and authoritative, with emphasis on data and control

3.2.2   Hardware Interface Requirements

HW-001: Client Device Requirements

- **Minimum Specifications:**

  – Processor: 1.5 GHz dual-core processor

  – RAM: 2 GB

  – Display: 1024x768 resolution

  – Internet: 2 Mbps broadband connection

  – Browser: Chrome 80+, Firefox 75+, Safari 12+, Edge 80+

– Storage: 500 MB free space for downloads

- **Recommended Specifications:**

  – Processor: 2.0 GHz quad-core processor

  – RAM: 4 GB or more

  – Display: 1366x768 resolution or higher

  – Internet: 5 Mbps broadband connection

  – Browser: Latest versions of modern browsers

  – Storage: 1 GB free space for downloads

- **Mobile Requirements:**

  – iOS: Version 12.0 or higher

  – Android: Version 8.0 or higher

  – Screen: 4.7 inches or larger

  – Browser: Latest Chrome or Safari

HW-002: Server Requirements

- **Web Server:**

  – CPU: 4 cores minimum, 8 cores recommended

  – RAM: 8 GB minimum, 16 GB recommended

  – Storage: 100 GB SSD minimum

  – Bandwidth: 100 Mbps minimum, 1 Gbps recommended

  – Operating System: Linux (Ubuntu 20.04 LTS or CentOS 8)

  – Web Server: Apache 2.4+ or Nginx 1.18+

- **Database Server:**

  – CPU: 4 cores minimum

  – RAM: 8 GB minimum

  – Storage: 200 GB minimum (with growth planning)

  – Database: MySQL 8.0+ or MariaDB 10.5+

- **Backup Storage:**

  – Separate storage for backups

  – Minimum 500 GB capacity

  – Secure offsite storage option

3.2.3   Software Interface Requirements

SI-002: Browser Compatibility

- **Primary Browsers:**
  - Google Chrome 80+
  - Mozilla Firefox 75+
  - Apple Safari 12+
  - Microsoft Edge 80+

- **Feature Support:**
  - HTML5 support required
  - CSS3 support required
  - JavaScript ES6+ support required
  - Cookie and local storage support required

- **Mobile Browsers:**
  - Mobile Chrome 80+
  - Mobile Safari 12+
  - Samsung Internet 12+

SI-003: Third-Party Integration Interfaces

- **Zoom Integration:**
  - Zoom REST API v2
  - OAuth 2.0 authentication
  - Webhook integration for events
  - Meeting creation and management APIs

- **Payment Gateway Integration:**
  - Standard payment APIs (Easypaisa, Jazzcash, etc.)
  - Secure payment processing
  - Transaction status webhooks
  - Receipt generation

- **Email Service Integration:**
  - SMTP protocol support
  - Email template management
  - Bulk email sending
  - Delivery tracking

4 System Features

This section describes the major features of AAK Academy Management System, organized by functional area. Each feature includes detailed description, stimulus/response sequences, and associated functional requirements.

4.1 Student Enrollment and Registration System

4.1.1 Description and Priority

Comprehensive system for student enrollment including registration, verification, subject selection, and fee calculation. This is the entry point for all students and includes the automated discount system.

Priority: High

4.1.2 Stimulus/Response Sequences

1. **Stimulus:** Prospective student visits academy website and clicks "Apply Now"
2. **Response:** System displays online registration form with multiple sections
3. **Stimulus:** Student fills personal information, academic background, and program selection
4. **Response:** System validates inputs in real-time, shows errors immediately
5. **Stimulus:** Student submits completed application
6. **Response:** System creates account in "Pending Verification" status, sends confirmation email
7. **Stimulus:** Admin reviews application in admin panel
8. **Response:** System shows complete application with verification checklist
9. **Stimulus:** Admin approves application
10. **Response:** System activates account, sends welcome email with login credentials
11. **Stimulus:** Student logs in for first time
12. **Response:** System prompts for subject selection with fee calculator
13. **Stimulus:** Student selects subjects (e.g., 6 subjects)
14. **Response:** System automatically applies 20% discount, shows final fee
15. **Stimulus:** Student confirms selection
16. **Response:** System generates enrollment confirmation and fee invoice

4.1.3 Functional Requirements

- FR-001: Student Registration

- FR-008: Subject Selection with Automatic Fee Calculation

- FR-029: Automated Discount System

- FR-024: Student Management (Admin side)

4.2   Academic Content Delivery System

4.2.1   Description and Priority

Platform for delivering learning materials, assignments, quizzes, and live classes to students. This is the core academic functionality of the system.

Priority: High

4.2.2   Stimulus/Response Sequences

1. **Stimulus:** Teacher uploads new lecture notes for Mathematics chapter 3

2. **Response:** System processes upload, generates thumbnails for PDF, makes available to enrolled students

3. **Stimulus:** Student accesses Mathematics course page

4. **Response:** System displays organized content by chapters and topics

5. **Stimulus:** Student clicks on chapter 3 materials

6. **Response:** System shows lecture notes, video links, practice problems

7. **Stimulus:** Teacher creates new assignment with deadline in 1 week

8. **Response:** System notifies enrolled students via email and dashboard alerts

9. **Stimulus:** Student submits assignment before deadline

10. **Response:** System confirms submission, updates student's submission status

11. **Stimulus:** Teacher grades assignment and provides feedback

12. **Response:** System updates student grade, notifies student of feedback

13. **Stimulus:** Teacher schedules live class for difficult topic

14. **Response:** System creates Zoom meeting, adds to class calendar

15. **Stimulus:** Student joins live class 5 minutes before start

16. **Response:** System marks attendance, provides access to Zoom meeting

4.2.3   Functional Requirements

- FR-009: Learning Materials Access

- FR-010: Assignment Management

- FR-011: Online Quiz System

- FR-013: Live Class Participation

- FR-016: Course Content Management

- FR-017: Assignment Creation and Management

- FR-018: Online Quiz Creation

- FR-019: Grading and Evaluation

- FR-021: Live Class Management

4.3 Performance Tracking and Analytics System

4.3.1 Description and Priority

Comprehensive system for tracking student performance, generating analytics, and providing insights to students, teachers, and administrators.
Priority: Medium

4.3.2 Stimulus/Response Sequences

1. **Stimulus:** Student completes quiz on Physics chapter 5
    2. **Response:** System records score, updates performance database
    3. **Stimulus:** Student views "My Performance" dashboard
    4. **Response:** System generates visual charts showing progress across subjects
    5. **Stimulus:** Teacher accesses class performance report
    6. **Response:** System shows distribution of grades, identifies struggling students
    7. **Stimulus:** Admin requests term-end performance report
    8. **Response:** System compiles data from all courses, generates comprehensive report
    9. **Stimulus:** System detects student with declining performance
    10. **Response:** System alerts teacher and suggests intervention
    11. **Stimulus:** Parent requests progress report (if parent portal implemented)
    12. **Response:** System generates student-specific report with teacher comments

4.3.3 Functional Requirements

- FR-012: Grade and Performance Tracking

- FR-020: Student Performance Monitoring

- FR-030: Report Generation

4.4 Fee Management and Financial System

4.4.1 Description and Priority

System for managing all financial aspects including fee calculation, discount application, payment tracking, and financial reporting.
Priority: High

4.4.2 Stimulus/Response Sequences

1. **Stimulus:** Admin configures fee structure for new academic year
    2. **Response:** System applies new fees to all relevant programs and subjects
    3. **Stimulus:** Student selects subjects during enrollment
    4. **Response:** System calculates fee, applies automatic discounts based on subject count
    5. **Stimulus:** System approaches fee due date for student
    6. **Response:** System sends automatic reminder email 7 days before due date
    7. **Stimulus:** Student makes partial payment
    8. **Response:** System updates balance, generates receipt, sends confirmation
    9. **Stimulus:** Admin views fee collection report for current month

10. **Response:** System shows collected amounts, outstanding balances, comparison to previous periods

11. **Stimulus:** Student requests fee concession due to financial hardship

12. **Response:** System routes request to admin, tracks approval process

13. **Stimulus:** Admin approves special discount for student

14. **Response:** System applies discount, recalculates balance, notifies student

4.4.3   Functional Requirements

- FR-008: Subject Selection with Automatic Fee Calculation

- FR-014: Fee Payment and Tracking

- FR-028: Fee Management

- FR-029: Automated Discount System

- FR-030: Report Generation

4.5   Faculty Management and Information System

4.5.1   Description and Priority

System for managing teacher information, assignments, and public faculty profiles.
Priority: Medium

4.5.2   Stimulus/Response Sequences

1. **Stimulus:** Admin adds new Physics teacher to system

2. **Response:** System creates teacher account, sends setup instructions

3. **Stimulus:** Admin assigns Physics teacher to Class 10 sections A and B

4. **Response:** System updates teacher workload, notifies teacher of new assignments

5. **Stimulus:** Teacher updates professional qualifications

6. **Response:** System updates teacher profile, flags for admin verification if needed

7. **Stimulus:** Prospective student views faculty page

8. **Response:** System displays organized faculty listings with photos, qualifications, subjects

9. **Stimulus:** Admin publishes teacher achievement

10. **Response:** System adds to faculty page highlights, notifies relevant stakeholders

11. **Stimulus:** Teacher requests leave through system

12. **Response:** System routes to admin, suggests substitute teachers based on subject expertise

4.5.3   Functional Requirements

- FR-002: Teacher Registration by Admin

- FR-025: Teacher Management

- FR-031: Faculty Information Page Management

4.6 Administrative Control and Reporting System

4.6.1 Description and Priority

Comprehensive system for academy administration including user management, system configuration, reporting, and monitoring.

Priority: High

4.6.2 Stimulus/Response Sequences

1. **Stimulus:** Admin logs into system
   2. **Response:** System displays admin dashboard with key metrics and alerts
   3. **Stimulus:** Admin needs to enroll 50 new students from recent admissions
   4. **Response:** System provides bulk import tool with validation
   5. **Stimulus:** Admin configures new academic session
   6. **Response:** System provides setup wizard for terms, holidays, grading periods
   7. **Stimulus:** Board requests student transcripts
   8. **Response:** System generates standardized transcripts with academy seal
   9. **Stimulus:** System detects unusual login patterns
   10. **Response:** System alerts admin, suggests security review
   11. **Stimulus:** Admin schedules automated backup
   12. **Response:** System confirms schedule, shows backup history
   13. **Stimulus:** Accreditation team requests operational data
   14. **Response:** System generates comprehensive reports on enrollment, performance, operations

4.6.3 Functional Requirements

- FR-023: Admin Dashboard

- FR-024: Student Management

- FR-025: Teacher Management

- FR-026: Academic Program Management

- FR-027: Subject and Course Management

- FR-030: Report Generation

- FR-032: System Configuration and Settings

- FR-033: Backup and Recovery Management

- FR-036: Audit Trail and Logging

5   Non-Functional Requirements

5.1   Performance Requirements

5.1.1   Response Time Requirements

- **NFR-001:** Page load time shall not exceed 3 seconds for 95% of page loads under normal load

- **NFR-002:** Search operations shall return results within 2 seconds for datasets up to 10,000 records

- **NFR-003:** Report generation shall complete within 30 seconds for standard reports

- **NFR-005:** File uploads shall process within acceptable time based on file size (1MB within 5 seconds on 2Mbps connection)

5.1.2   Throughput Requirements

- **NFR-006:** System shall support minimum 500 concurrent users

- **NFR-007:** System shall handle peak loads of 1000 concurrent users during enrollment periods

- **NFR-008:** Web server shall handle 100 requests per second

- **NFR-009:** Database shall support 50 concurrent read/write operations

5.1.3   Scalability Requirements

- **NFR-014:** System shall scale horizontally to support up to 5000 students

- **NFR-015:** Database shall handle growth to 100,000 academic records

- **NFR-016:** Storage system shall support expansion to 1TB without architectural changes

- **NFR-017:** Application architecture shall support load balancing across multiple servers

5.2   Security Requirements

5.2.1   Authentication Security

- **NFR-018:** Passwords shall be stored using bcrypt hashing algorithm with minimum cost factor of 10

- **NFR-019:** Accounts shall be locked after 5 consecutive failed login attempts

- **NFR-020:** Session timeout shall be enforced based on user role and sensitivity

- **NFR-021:** Password policies shall enforce minimum 8 characters with mixed case and numbers

5.2.2   Authorization and Access Control

- **NFR-023:** Role-based access control shall be implemented for all system functions

- **NFR-024:** Principle of least privilege shall be enforced

- **NFR-025:** Administrative functions shall require re-authentication for sensitive operations

- **NFR-026:** User shall only access their own data unless explicitly granted permission

- **NFR-027:** Audit logs shall track all permission changes and access violations

5.2.3   Data Security

- **NFR-028:** All sensitive data shall be encrypted at rest using AES-256 encryption

- **NFR-029:** All data transmissions shall use TLS 1.2 or higher

- **NFR-030:** Database connections shall use SSL encryption

- **NFR-031:** File uploads shall be scanned for malware before storage

- **NFR-032:** Backup data shall be encrypted and stored securely

5.2.4   Input Validation and Sanitization

- **NFR-033:** All user inputs shall be validated both client-side and server-side

- **NFR-034:** SQL injection prevention shall be implemented using parameterized queries

- **NFR-035:** Cross-site scripting (XSS) protection shall be implemented through output encoding

- **NFR-036:** File uploads shall be restricted to approved file types and sizes

- **NFR-037:** CSRF tokens shall be implemented for all state-changing operations

5.2.5   Audit and Logging

- **NFR-038:** All authentication attempts shall be logged with IP address and timestamp

- **NFR-039:** All data modifications shall be logged with before/after values

- **NFR-040:** Grade changes shall require additional authorization and be fully audited

- **NFR-041:** Financial transactions shall have complete audit trails

- **NFR-042:** Logs shall be retained for minimum 1 year for security analysis

5.3   Reliability and Availability Requirements

5.3.1   Availability Requirements

- **NFR-043:** System shall maintain 99% uptime during academic periods (7am-10pm)

- **NFR-044:** Scheduled maintenance shall be announced 48 hours in advance

- **NFR-045:** Unscheduled downtime shall not exceed 4 hours per month

- **NFR-046:** System shall have disaster recovery plan with RTO of 24 hours

- **NFR-047:** Data recovery point objective shall be maximum 1 hour of data loss

5.3.2   Reliability Requirements

- **NFR-048:** Mean Time Between Failures (MTBF) shall exceed 720 hours (30 days)

- **NFR-049:** Mean Time To Repair (MTTR) shall be less than 2 hours for critical failures

- **NFR-050:** System shall have automatic failover for critical components

- **NFR-051:** Database shall have replication for high availability

- **NFR-052:** Error rate shall not exceed 1% of all transactions

5.3.3   Backup and Recovery

- **NFR-053:** Full system backups shall be performed weekly

- **NFR-054:** Incremental backups shall be performed daily

- **NFR-055:** Backup restoration shall be tested quarterly

- **NFR-056:** Backups shall be stored in geographically separate location

- **NFR-057:** Backup retention shall be minimum 90 days

5.4   Usability Requirements

5.4.1   User Interface Usability

- **NFR-058:** System shall achieve 85% satisfaction rating in user acceptance testing

- **NFR-059:** New students shall be able to complete registration within 10 minutes

- **NFR-060:** Teachers shall be able to create a quiz within 15 minutes

- **NFR-061:** Common tasks shall require maximum 3 clicks from dashboard

- **NFR-062:** Error messages shall be clear and suggest corrective actions

5.4.2   Accessibility Requirements

- **NFR-063:** System shall comply with WCAG 2.1 Level AA accessibility standards

- **NFR-064:** All images shall have appropriate alt text

- **NFR-065:** System shall be fully navigable by keyboard

- **NFR-066:** Color contrast shall meet WCAG requirements

- **NFR-067:** Text shall be resizable up to 200% without breaking layout

5.4.3   Documentation and Help

- **NFR-068:** Context-sensitive help shall be available for all major functions

- **NFR-069:** User manuals shall be available in downloadable PDF format

- **NFR-070:** Video tutorials shall be provided for complex tasks

- **NFR-071:** FAQ section shall address common user questions

- **NFR-072:** Support contact information shall be easily accessible

5.5   Maintainability Requirements

5.5.1   Code Maintainability

- **NFR-073:** Code shall follow consistent naming conventions and coding standards

- **NFR-074:** Code documentation shall cover all major functions and modules

- **NFR-075:** Code complexity shall be managed with modular design

- **NFR-076:** Technical debt shall be tracked and managed

5.5.2   System Maintainability

- **NFR-077:** System shall support hot deployment for minor updates

- **NFR-078:** Configuration shall be externalized for easy updates

- **NFR-079:** Database migrations shall be scripted and versioned

- **NFR-080:** Monitoring shall provide early warning of issues

5.5.3   Extensibility

- **NFR-081:** System architecture shall support addition of new modules

- **NFR-082:** API shall be designed for future integration needs

- **NFR-083:** Database schema shall support future enhancements

- **NFR-084:** Plugin architecture shall be considered for additional features

5.6 Operational Requirements

5.6.1 Monitoring Requirements

- **NFR-089:** System health shall be monitored 24/7

- **NFR-090:** Performance metrics shall be collected and analyzed

- **NFR-091:** Alerts shall be configured for critical issues

- **NFR-092:** Usage statistics shall be tracked for capacity planning

5.6.2 Support Requirements

- **NFR-093:** Help desk system shall be integrated for user support

- **NFR-094:** Common issues shall have documented resolutions

- **NFR-095:** Support response time shall be within 24 hours for non-critical issues

- **NFR-096:** Emergency support shall be available during academic hours

6   Other Requirements

6.1   Development Requirements

6.1.1   Development Methodology

- **OR-001:** Project shall follow Agile methodology with 2-week sprints

- **OR-002:** Version control shall be maintained using Git with feature branching

- **OR-003:** Code reviews shall be conducted for all major changes

- **OR-004:** Continuous integration shall be implemented with automated testing

6.1.2   Documentation Requirements

- **OR-005:** Comprehensive technical documentation shall be maintained

- **OR-006:** API documentation shall be generated using OpenAPI/Swagger

- **OR-007:** User manuals shall be created for all user roles

- **OR-008:** Deployment and operations documentation shall be comprehensive

6.1.3   Testing Requirements

- **OR-009:** Unit testing shall achieve 80% code coverage for critical modules

- **OR-010:** Integration testing shall validate all system components

- **OR-011:** User acceptance testing shall involve actual academy users

- **OR-012:** Performance testing shall simulate peak load conditions

- **OR-013:** Security testing shall include vulnerability scanning

6.1.4   Quality Assurance

- **OR-014:** Code quality metrics shall be tracked and maintained

- **OR-015:** Peer reviews shall be conducted for all deliverables

- **OR-016:** Quality gates shall be established for each development phase

- **OR-017:** Defect tracking shall be maintained throughout project lifecycle

6.2   Legal and Regulatory Requirements

6.2.1   Data Privacy and Protection

- **OR-018:** System shall comply with applicable data protection regulations

- **OR-019:** Privacy policy shall be clearly communicated to all users

- **OR-020:** User consent shall be obtained for data processing

- **OR-021:** Data retention policies shall be defined and implemented

- **OR-022:** User data export and deletion procedures shall be available

6.2.2   Intellectual Property

- **OR-023:** All source code shall be owned by the development team/academy

- **OR-024:** Third-party components shall be properly licensed

- **OR-025:** User agreement shall define terms of use and IP rights

- **OR-026:** Academic content rights shall be clearly defined

6.2.3   Compliance Requirements

- **OR-027:** System shall comply with educational regulations

- **OR-028:** Financial reporting shall meet accounting standards

- **OR-029:** Academic records shall be maintained as per board requirements

- **OR-030:** Accessibility compliance shall be verified and documented

6.3   System Support Requirements

6.3.1   Training Requirements

- **OR-031:** Administrator training shall be provided before system launch

- **OR-032:** Teacher training workshops shall be conducted

- **OR-033:** Student orientation sessions shall be organized

- **OR-034:** Training materials shall be updated with system changes

6.3.2   Maintenance Requirements

- **OR-035:** Regular security updates shall be applied

- **OR-036:** Performance monitoring shall be continuous

- **OR-037:** Backup procedures shall be tested regularly

- **OR-038:** System updates shall be scheduled during low-usage periods

6.3.3   Disaster Recovery

- **OR-039:** Disaster recovery plan shall be documented and tested annually

- **OR-040:** Critical system recovery time objective shall be 24 hours

- **OR-041:** Data recovery point objective shall be 1 hour

- **OR-042:** Backup systems shall be geographically distributed

6.4   Sustainability Requirements

6.4.1   Environmental Considerations

- **OR-043:** System shall optimize resource usage to minimize energy consumption

- **OR-044:** Code efficiency shall be prioritized to reduce server load

- **OR-045:** Sustainable hosting options shall be considered

- **OR-046:** Paper usage reduction shall be tracked and reported

### 6.4.2   Long-term Viability

- **OR-047:** System architecture shall support 5-year roadmap

- **OR-048:** Technology stack shall use well-supported frameworks

- **OR-049:** Knowledge transfer shall be planned for sustainability

- **OR-050:** Exit strategy shall be defined for system decommissioning

Appendices

Appendix A: Glossary

Term	Detailed Definition
AAK Academy	Amar Ahmad Khan Academy, the educational institution for which this system is developed, offering Matric and Intermediate programs.
Matric Program	Secondary School Certificate program covering 9th and 10th grades, following Punjab Board curriculum.
Intermediate Program	Higher Secondary School Certificate program covering 11th and 12th grades, with pre-engineering, pre-medical, and commerce streams.
Automated Discount System	System feature that automatically applies percentage discounts to total fees based on number of subjects selected (10% for 3 subjects, 20% for 6 subjects).
Faculty Information Page	Public-facing section of the system that displays teacher profiles, qualifications, experience, and contact information.
Live Class Integration	System integration with Zoom video conferencing platform to facilitate virtual classrooms with attendance tracking.
Student Dashboard	Personalized interface for students displaying academic information, assignments, grades, and notifications.
Teacher Dashboard	Interface for teachers to manage courses, create assessments, grade submissions, and track student performance.
Admin Dashboard	Comprehensive management interface for administrators to oversee all system operations, users, and configurations.
Role-Based Access Control (RBAC)	Security model that restricts system access based on user roles (Student, Teacher, Admin) and associated permissions.
Academic Session	Annual academic cycle typically divided into two terms or semesters, with defined start and end dates.
Subject Selection	Process where students choose their courses for the academic session, with real-time fee calculation and discount application.
Learning Management System (LMS)	Platform for delivering educational content, managing assignments and assessments, and tracking student progress.
Grade Point Average (GPA)	Numerical representation of a student's academic performance, calculated based on grades across all subjects.
Audit Trail	Comprehensive record of system activities including user actions, data changes, and security events for accountability and trou-

Appendix B: Analysis Models

B.1. Use Case Diagram
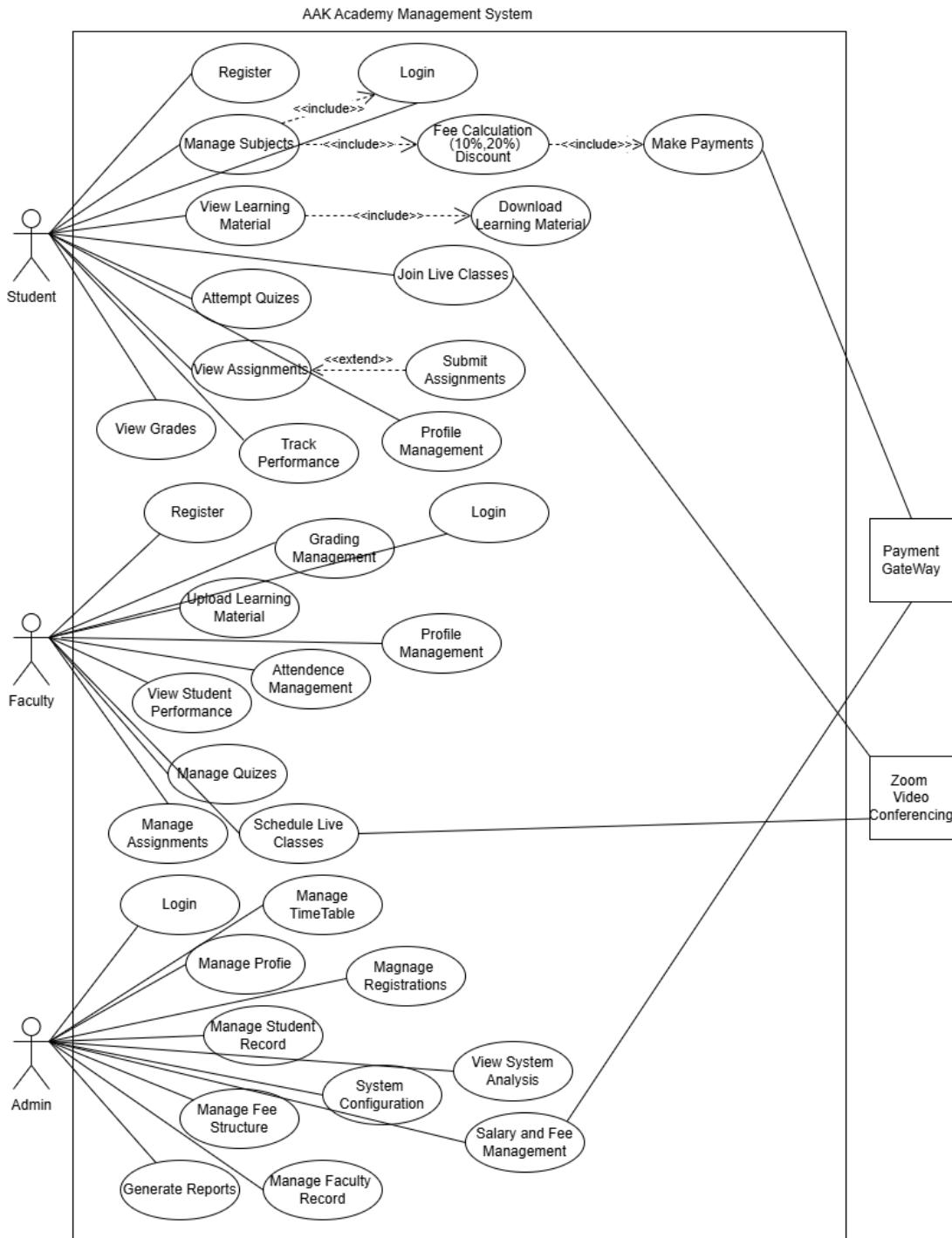
Figure 1: Use Case Diagram showing interactions between Students, Teachers, Administrators, and the AAK Academy Management System
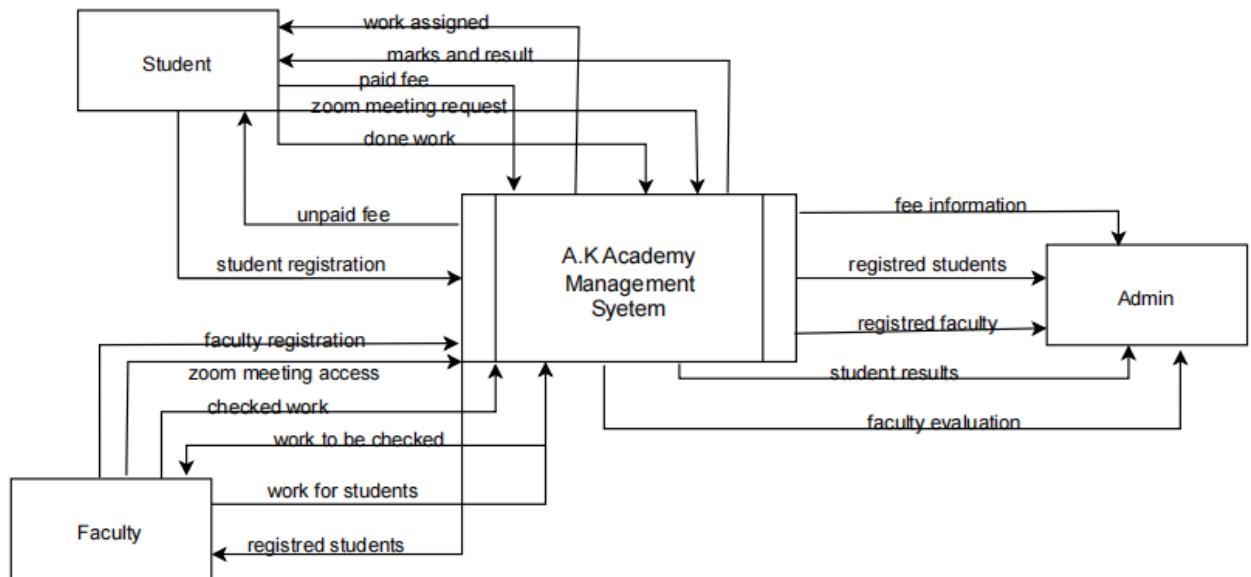
B.2. Context Diagram

Figure 2: Context Diagram