# **Software Requirements Specification (SRS)**

## **Learning Management System with Personalized Recommendations**

## **Team:**

### Arshiya Noureen

### Kushal Mangla

### Sanyam Agrawal

### Shreyas Deb

### Vishak Kashyap K

## **1. Brief Problem Statement**

The project aims to develop a Learning Management System (LMS) that provides personalized learning experiences through AI-powered recommendations. The system will enable users to access various self-learning materials including videos, blogs, and resources, with content suggestions tailored to their skill level and interests, similar to Netflix's recommendation system. The platform will serve multiple user roles including learners, coaches, and administrators, each with specific functionalities and access levels.

## **2. System Requirements**

### **2.1 Technical Requirements**

* Frontend: React.js with TypeScript, Tailwind CSS
* Backend: Node.js with Express.js
* Database: MongoDB
* Recommendation Engine: Python with ML libraries (scikit-learn, pandas, numpy)
* Authentication: JWT
* APIs: REST APIs for communication
* Hosting: Two VM nodes
  + Node 1: Frontend and Moodle
  + Node 2: Backend and Recommendation Engine
* Integration Requirements: Moodle LMS

### **2.2 Hardware Requirements**

* Server Requirements:
  + Two separate VM nodes for hosting different components
  + Sufficient storage for learning materials and user data
  + Adequate RAM and processing power for ML operations
* Client Requirements:
  + Modern web browser
  + Internet connection
  + No specific hardware requirements for end-users

## **3. User Profile**

### **3.1 Learners**

* Primary users of the system
* Varying levels of technical expertise (beginner to advanced)
* Comfortable with basic web navigation
* Interested in self-paced learning
* May access the system from various devices

### **3.2 Coaches**

* Subject matter experts
* Familiar with content management systems
* Responsible for content creation and learner monitoring
* Regular users of the system

**4. Feature Requirements & Use Case Diagram**

|  |  |  |  |
| --- | --- | --- | --- |
| **No** | **Use Case Name** | **Overview** | **Release** |
| 1 | Signup | Allows new users to create an account in the LMS system. | R1 |
| 2 | Login | Allows registered users to access their account in the LMS system. | R1 |
| 3 | View or Edit Profile | Allows learners to view and modify their personal information in the "About Me" page. | R1 |
| 4 | Set Learning Preferences | Allows learners to set and update their learning preferences, which influence course recommendations. | R2 |
| 5 | View Available Articles and Videos | Allows learners to browse and view articles and videos available on the platform. | R1 |
| 6 | View Available and Enrolled Courses | Allows learners to see all available courses on the dashboard and view the courses they are enrolled in on the courses page. | R1 |
| 7 | Enroll in a Course | Allows learners to enroll in courses they are interested in. | R1 |
| 8 | View Enrolled Courses’ Content | Allows learners to access and view the content of courses they have enrolled in. | R1 |
| 9 | Complete Enrolled Courses’ Activities | Allows learners to complete and mark activities as complete. | R1 |
| 10 | View Recommended Courses Videos Articles | Displays personalized recommendations for courses, videos, and articles based on the learner's preferences and past activities. | R2 |
| 11 | View Learning Progress | Allows learners to track their progress in enrolled courses on the Analysis Page. | R2 |
| 12 | View Teaching Courses | Allows coaches to view all courses they are teaching. | R1 |
| 13 | Manage Course Content | Allows coaches to manage (add, edit, remove) content for courses they are teaching. | R2 |
| 14 | View Learner’s Progress | Allows coaches to monitor the progress of learners enrolled in their courses. | R2 |
| 15 | Register Learner in Moodle | Automatically registers a new user in Moodle when they first log in to the LMS. | R1 |
| 16 | Fetch Courses from Moodle | Retrieves all available courses from Moodle to display in the LMS. | R1 |
| 17 | Enroll in Moodle Course | Enrolls a learner in a Moodle course when they enroll through the LMS. | R1 |
| 18 | Fetch Course Content | Retrieves course content from Moodle to display in the LMS. | R1 |
| 19 | Generate Recommendations | Generates personalized course, article, and video recommendations for learners based on their preferences and activity history. | R2 |
| 20 | Autologin into Moodle | Automatically logs coaches into Moodle when they access course management features. | R2 |

## 

**5. Use Case Descriptions**

### **UC-01: Signup**

## **Overview:** Allows new users to create an account in the LMS system.

## **Actors:**

## Unregistered User

## **Precondition:**

## The user is not logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## User navigates to the signup page.

## User enters required information (username, email, password, etc.).

## System validates the information.

## System creates a new user account.

## System confirms successful registration.

#### **Alternate Flows:**

## If the email or username already exists, the system displays an error message.

## If the password doesn't meet security requirements, the system prompts the user to create a stronger password.

## **Postcondition:**

## A new user account is created and verified.

### 

### **UC-02: Login**

## **Overview:** Allows registered users to access their account in the LMS system.

## **Actors:**

## Registered User (Learner or Coach)

## **Precondition:**

## The user has a verified account in the system.

## **Flow:**

#### **Main (Success) Flow:**

## User navigates to the login page.

## User enters their credentials (username/email and password).

## System validates the credentials.

## System logs the user into their account.

## System redirects the user to their dashboard.

#### **Alternate Flows:**

## If credentials are invalid, the system displays an error message.

## **Postcondition:**

## User is authenticated and has access to their account.

### 

### 

### **UC-03: View or Edit Profile**

## **Overview:** Allows learners to view and modify their personal information in the "About Me" page.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the "About Me" page.

## System displays the learner's current profile information.

## Learner edits the profile information.

## Learner submits the changes.

## System validates and saves the updated information.

#### **Alternate Flows:**

## If validation fails, the system displays error messages for the invalid fields.

## If the learner cancels the editing process, no changes are saved.

## **Postcondition:**

## Learner's profile information is updated or viewed.

## 

### 

### **UC-04: Set Learning Preferences**

## **Overview:** Allows learners to set and update their learning preferences, which influence course recommendations.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the "About Me" page.

## Learner selects the learning preferences section.

## System displays current learning preferences.

## Learner selects or modifies their interests, preferred learning methods, or other preferences.

## Learner submits the changes.

## System saves the updated preferences.

#### **Alternate Flows:**

## If the learner cancels the process, no changes are saved.

## **Postcondition:**

## Learner's learning preferences are updated and will affect future course recommendations.

## 

### **UC-05: View Available Articles and Videos**

## **Overview:** Allows learners to browse and view articles and videos available on the platform.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the articles or videos section.

## System displays a list of available articles or videos.

## Learner filters or searches for specific content.

## Learner selects an article or video.

## System displays the selected content.

#### **Alternate Flows:**

## If no articles or videos match the search criteria, the system displays a message indicating no results.

## If content fails to load, the system displays an error message.

## **Postcondition:**

## Learner accesses and views the desired articles or videos.

## 

### 

### **UC-06: View Available and Enrolled Courses**

## **Overview:** Allows learners to see all available courses on the dashboard and view the courses they are enrolled in on the courses page.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the dashboard.

## System displays a section with all available courses.

## Learner navigates to the courses page.

## System displays a list of all courses the learner is enrolled in.

#### **Alternate Flows:**

## If there are no available courses, the system displays a message indicating this.

## If the learner has not enrolled in any courses, the courses page is empty or displays a message.

## **Postcondition:**

## Learner views all available courses on the dashboard and accesses their enrolled courses on the courses page.

## 

### **UC-07: Enroll in a Course**

## **Overview:** Allows learners to enroll in courses they are interested in.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the available courses section in the dashboard.

## Learner selects a course they want to enroll in.

## Learner clicks the "Enroll" button.

## System confirms the enrollment.

## System adds the course to the learner's enrolled courses list.

## System registers the learner for this course in Moodle.

#### **Alternate Flows:**

## If enrollment fails in the LMS or Moodle, the system displays an error message.

## **Postcondition:**

## Learner is enrolled in the selected course both in the LMS and Moodle.

### 

### 

### **UC-08: View Enrolled Courses' Content**

## **Overview:** Allows learners to access and view the content of courses they have enrolled in.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system and enrolled in at least one course.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the courses section.

## Learner selects a specific course.

## System redirects to the detailed course page.

## System fetches and displays the course content and activities from Moodle.

## Learner navigates through different sections and activities of the course.

#### **Alternate Flows:**

## If course content fails to load from Moodle, the system displays an error message.

## **Postcondition:**

## Learner views the content of their enrolled course.

## 

### **UC-09: Complete Enrolled Courses' Activities**

## **Overview:** Allows learners to complete and mark activities as complete.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system and viewing course content of an enrolled course.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to a specific activity in the course.

## Learner completes the activity.

## Learner clicks the "Complete" button.

## System marks the activity as complete.

## System updates the learner's progress for the course.

#### **Alternate Flows:**

## If activity completion fails to update, the system displays an error message.

## **Postcondition:**

## Activity is marked as complete and the learner's progress is updated.

### 

### **UC-10: View Recommended Courses, Videos, Articles**

## **Overview:** Displays personalized recommendations for courses, videos, and articles based on the learner's preferences and past activities.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the dashboard.

## System processes the learner's preferences and past activities.

## System generates recommendations for courses, videos, and articles.

## System displays the recommendations in separate sections: recommended courses, recommended articles, and recommended videos.

#### **Alternate Flows:**

## If no recommendations can be generated due to lack of data, the system suggests setting learning preferences.

## **Postcondition:**

## Learner views personalized recommendations for learning resources.

## 

### 

### **UC-11: View Learning Progress**

## **Overview:** Allows learners to track their progress in enrolled courses on the Analysis Page.

## **Actors:**

## Learner

## **Precondition:**

## The learner is logged into the system and enrolled in at least one course.

## **Flow:**

#### **Main (Success) Flow:**

## Learner navigates to the Analysis Page.

## System retrieves progress data for all enrolled courses.

## System calculates completion percentages based on completed activities.

## System displays progress metrics for each course: completed activities, pending activities, overall completion percentage.

## Learner views their progress across all enrolled courses.

#### **Alternate Flows:**

## If progress data retrieval fails, the system displays an error message.

## If the learner is not enrolled in any courses, the system displays a message suggesting to enroll.

## **Postcondition:**

## Learner views their learning progress across all courses.

### **UC-12: View Teaching Courses**

## **Overview:** Allows coaches to view all courses they are teaching.

## **Actors:**

## Coach

## **Precondition:**

## The coach is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Coach logs into the system.

## System identifies the user as a coach.

## System retrieves all courses assigned to the coach.

## System displays the list of courses the coach is teaching.

#### **Alternate Flows:**

## If the coach is not assigned to any courses, the system displays a message indicating this.

## If course data retrieval fails, the system displays an error message.

## **Post Condition:**

## Coach views a list of all courses they are teaching.

### **UC-13: Manage Course Content**

## **Overview:** Allows coaches to manage (add, edit, remove) content for courses they are teaching.

## **Actors:**

## Coach

## **Precondition:**

## The coach is logged into the system and has selected a course they are teaching.

## **Flow:**

#### **Main (Success) Flow:**

## Coach selects a course they are teaching.

## System automatically logs the coach into Moodle.

## System redirects to the Moodle course page.

## Coach manages course content within Moodle (adds, edits, or removes content).

## Changes are saved in Moodle.

#### **Alternate Flows:**

## If auto-login to Moodle fails, system provides manual login option.

## If content changes fail to save in Moodle, system displays an error message.

## **Post Condition:**

## Course content is updated in Moodle.

### 

### **UC-14: View Learner's Progress**

## **Overview:** Allows coaches to monitor the progress of learners enrolled in their courses.

## **Actors:**

## Coach

## **Precondition:**

## The coach is logged into the system.

## **Flow:**

#### **Main (Success) Flow:**

## Coach navigates to a specific course they are teaching.

## System displays a list of all learners enrolled in the course.

## Coach selects a specific learner or views aggregate progress.

## System displays detailed progress information: completed activities, pending activities etc.

#### **Alternate Flows:**

## If learner progress data retrieval fails, system displays an error message.

## If no learners are enrolled in the course, system displays a message indicating this.

## **Post Condition:**

## Coach views progress of learners in their courses.

### 

### **UC-15: Register Learner in Moodle**

## **Overview:** Automatically registers a new user in Moodle when they first log in to the LMS.

## **Actors:**

## System

## **Precondition:**

## A new user has successfully created an account for the first time.

## **Flow:**

#### **Main (Success) Flow:**

## System sends registration request to Moodle API with user credentials.

## Moodle creates a new user account.

## Moodle returns confirmation of successful registration.

## System stores Moodle user ID in the local database.

#### **Alternate Flows:**

## If Moodle registration fails, system displays error to user.

## **Post Condition:**

## User is registered in both the LMS and Moodle.

## 

### 

### 

### **UC-16: Fetch Courses from Moodle**

## **Overview:** Retrieves all available courses from Moodle to display in the LMS.

## **Actors:**

## System

## **Precondition:**

## The system has an established connection to Moodle and is ready to fetch course data.

## **Flow:**

#### **Main (Success) Flow:**

## System sends request to Moodle API for all available courses.

## Moodle returns course data (titles, descriptions, IDs, etc.).

## System shows it in the dashboard.

#### **Alternate Flows:**

## If course data processing fails, system logs the error

## **Post Condition:**

## Course catalog in the LMS is updated with the latest information from Moodle.

### 

### 

### 

### **UC-17: Enroll in Moodle Course**

## **Overview:** Enrolls a learner in a Moodle course when they enroll through the LMS.

## **Actors:** System

## **Precondition:** A learner has selected to enroll in a course through the LMS.

## **Flow:** **Main (Success) Flow:**

## System receives enrollment request from the LMS.

## System sends enrollment request to Moodle API with learner and course IDs.

## Moodle enrolls the learner in the course.

## Moodle returns confirmation of successful enrollment.

## System updates the learner's enrollment status in the local database.

## **Alternate Flows:**

## If Moodle enrollment fails,system notifies the learner of the enrollment failure.

## **Post Condition:** Learner is enrolled in the course in both the LMS and Moodle.

### **UC-18: Fetch Course Content**

## **Overview:** Retrieves course content from Moodle to display in the LMS.

## **Actors:** System

## **Precondition:** A learner has accessed a course they are enrolled in.

## **Flow:** **Main (Success) Flow:**

## System receives request to display course content.

## System sends request to Moodle API for specific course content.

## Moodle returns course activities, resources, and structure.

## System processes and displays the course content in the LMS interface.

## **Alternate Flows:**

## If course content processing fails, system logs the error.

## **Post Condition:** Course content from Moodle is displayed in the LMS interface.

## 

### 

### 

### 

### 

### **UC-19: Generate Recommendations**

## **Overview:** Generates personalized course, article, and video recommendations for learners based on their preferences and activity history.

## **Actors:** System

## **Precondition:** A learner with established preferences or activity history accesses the dashboard.

## **Flow:** **Main (Success) Flow:**

## System retrieves learner's preferences and activity history.

## System processes data through the recommendation engine.

## System generates personalized recommendations for courses, articles, and videos.

## System ranks recommendations by relevance.

## System displays top recommendations in each category on the dashboard.

## **Alternate Flows:**

## If learner has limited history, system relies more heavily on stated preferences.

## **Post Condition:** Personalized recommendations are displayed to the learner.

## 

## 

### **UC-20: Autologin into Moodle**

## **Overview:** Automatically logs coaches into Moodle when they access course management features.

## **Actors:** System

## **Precondition:** A coach has selected to manage a course.

## **Flow:** **Main (Success) Flow:**

## Coach selects to manage a course.

## System retrieves coach's Moodle credentials.

## System sends authentication request to Moodle API.

## Moodle authenticates the coach.

## System redirects coach to the appropriate Moodle course page.

## **Alternate Flows:**

## If automatic login fails, system provides coach with manual login link.

## **Post Condition:** Coach is logged into Moodle and can manage course content.

## 