**AI-Powered Adaptive Online Learning Platform**

**Functional Requirements**

1. **User Management & Authentication**
   * **Student Registration & Login**: Students can register and log in using email, password, or Google authentication.
   * **Admin Controls**: Admin can approve, block, or delete student accounts.
   * **Password Reset & Account Recovery**: Options available for resetting passwords and recovering accounts.
2. **AI-Based Personalized Learning Path**
   * **Performance Tracking**: AI tracks student performance through quiz scores and time spent on tasks.
   * **Adaptive Quiz Difficulty**: AI adjusts quiz difficulty based on past results, ensuring personalized learning.
   * **Weak Topic Identification**: AI identifies weak topics and suggests areas for improvement.
3. **AI-Generated Quizzes & Automated Answer Evaluation**
   * **Quiz Generation**: AI generates quizzes with different formats, including MCQs, True/False questions, and Descriptive answers.
   * **Answer Evaluation with NLP**: AI evaluates descriptive answers using Natural Language Processing (NLP) for better accuracy.
   * **Instant Feedback**: AI provides instant feedback, showing correct answers and offering explanations.
4. **AI-Powered Study Recommendations**
   * **Personalized Learning Materials**: AI recommends learning materials like videos, PDFs, and e-books based on the student’s needs.
   * **External Course Suggestions**: AI suggests relevant courses from platforms like Udemy, Coursera, and edX.
   * **Focus on Weak Topics**: AI prioritizes areas where the student is struggling and tailors recommendations accordingly.
5. **Progress Tracking & Reports**
   * **Weekly Reports**: AI generates progress reports for students that include quiz scores, accuracy, speed, and strengths/weaknesses.
   * **Graphical Insights**: Provides graphical tracking to visualize progress and areas that need improvement.
6. **Smart Adaptive Scheduling**
   * **Optimal Study Time**: AI detects the best study time for each student based on their performance trends.
   * **Study Breaks & Schedule Suggestions**: AI suggests breaks and optimal study schedules to boost performance.
   * **Example**: If a student performs best at night, AI recommends late-night study sessions.
7. **Admin Dashboard & Monitoring**
   * **Performance Monitoring**: Admin can monitor student performance, quiz results, and areas needing improvement.
   * **Course Management**: Admin can add courses, topics, and learning materials.
   * **AI Settings Adjustment**: Admin can modify AI settings like quiz difficulty and topic weightage to suit the learning needs.

**Non-Functional Requirements**

1. **Performance & Speed**
   * **Instant Quiz Generation**: The system should generate quizzes immediately without delays.
   * **Minimal AI Processing Time**: AI should process results and feedback with minimal delay to ensure a smooth user experience.
2. **Security & Data Protection**
   * **Data Encryption**: User data should be encrypted to ensure privacy and prevent unauthorized access.
   * **Secure Login**: OAuth (Google Sign-In) for secure and reliable authentication.
3. **Scalability**
   * **Handling Multiple Users**: The platform should be able to support many students simultaneously without any performance issues.
   * **Scalable AI Models**: The AI models should adapt and scale as the number of users increases.
4. **Usability & User Experience**
   * **Intuitive UI**: The platform should have a clean and simple user interface that is easy to navigate.
   * **Easy Access to Resources**: Students should easily find their quizzes, study materials, and reports.
5. **Reliability & Availability**
   * **24/7 Availability**: The platform should be operational around the clock without any downtime.
   * **Fault Tolerance**: The AI system should remain functional even if one module or component fails.
6. **AI Explainability & Transparency**
   * **Clear Recommendations**: AI should provide clear, understandable explanations for its suggestions.
   * **Example**: Instead of saying, "You need to study algebra," the AI should explain, "Your algebra accuracy is 60%, below the required 75%. Focus on solving equations to improve."