**1. Product Functions**

The proposed educational platform integrates web and mobile applications to connect **students, teachers, and parents** within one intelligent learning environment. The system provides the following main functional modules:

**1. User Management Module**

* Handles **registration, authentication, and authorization** for three user types: Student, Teacher, and Parent.
* Provides role-based dashboards and permissions.
* Supports **profile management** (update personal info, password, profile picture, etc.).

**2. Course & Lesson Management**

* Teachers can **create, update, and manage courses**, lessons, and study materials (PDFs, videos, etc.).
* Students can **view and access** available lessons per subject.
* Lessons may include multimedia content stored in **MongoDB**.

**3. Assignment & Exam Management**

* Teachers can **create assignments and exams** (manual or AI-generated).
* Students can **take exams or submit assignments** online.
* System supports **automatic correction and grading**.
* Teachers can **review and adjust grades manually** if needed.

**4. AI-Powered Learning Assistance**

* **Chatbot** to help students answer academic questions or guide them through platform usage.
* **AI Exam Generator** that creates randomized or topic-based questions automatically.
* **Performance Analyzer** that identifies students’ weaknesses and recommends targeted exercises.
* **Teacher Insights Dashboard** showing collective weak areas among students to improve teaching strategies.

**5. Progress Tracking & Analytics**

* Students can **track their progress**, grades, and achievements.
* Parents can **monitor their children’s performance and attendance**.
* Teachers can **analyze overall performance trends** via graphical reports and statistics.

**6. Communication & Collaboration**

* Integration with **Google Meet** for live classes.
* **In-app messaging or notifications** for reminders, new lessons, or exam alerts.
* **Push notifications** in the mobile app (Flutter) for updates.

**7. Gamification System**

* Students earn **coins or rewards** for completing lessons, assignments, or achieving high grades.
* Coins can be displayed in dashboards to **encourage engagement and motivation**.

**8. File Management**

* Upload and manage **PDFs, videos, and notes** through a secure API using **Multer**.
* Store structured data in **PostgreSQL** and unstructured files in **MongoDB**.

**2. Functional Requirements**

Below are the detailed **functional requirements**, organized by module.

**2.1 User Management**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-1 | User Registration | The system shall allow users (students, teachers, parents) to register using email or phone number. |
| FR-2 | Authentication | The system shall authenticate users using JWT-based login. |
| FR-3 | Role Management | The system shall assign roles and access permissions (Student, Teacher, Parent). |
| FR-4 | Profile Management | Users shall be able to view and update their profiles. |
| FR-5 | Password Management | The system shall support password hashing (bcrypt) and reset functionality. |

**2.2 Course & Lesson Management**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-6 | Course Creation | Teachers shall be able to create, edit, and delete courses. |
| FR-7 | Lesson Upload | Teachers shall upload lesson materials (PDF, video, notes). |
| FR-8 | Lesson Access | Students shall access lessons for their enrolled courses. |
| FR-9 | Multimedia Support | The system shall support streaming or downloading lesson videos. |

**2.3 Assignment & Exam Management**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-10 | Exam Creation | Teachers shall create exams manually or via AI generator. |
| FR-11 | Exam Participation | Students shall take exams within a time limit and submit answers. |
| FR-12 | Auto Correction | The system shall automatically correct objective questions. |
| FR-13 | Manual Review | Teachers shall review subjective answers and adjust grades. |
| FR-14 | Grade Storage | The system shall store grades in PostgreSQL linked to users and exams. |
| FR-15 | Submission Tracking | The system shall track submission time and attempt history. |

**2.4 AI Features**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-16 | AI Chatbot | The system shall provide an AI-powered chatbot to assist students. |
| FR-17 | AI Exam Generator | The system shall generate exam questions based on selected topics or difficulty. |
| FR-18 | Performance Analysis | The AI module shall analyze student results and identify weak areas. |
| FR-19 | Teacher Insights | The system shall aggregate common weak areas across students for teachers. |

**2.5 Progress Tracking & Analytics**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-20 | Performance Dashboard | The system shall display a dashboard for students showing progress and grades. |
| FR-21 | Parent Dashboard | Parents shall access reports about their child’s performance and attendance. |
| FR-22 | Teacher Reports | Teachers shall view analytics for course performance and student progress. |
| FR-23 | Data Visualization | The system shall visualize data (charts, graphs) for progress tracking. |

**2.6 Communication & Notifications**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-24 | Google Meet Integration | The system shall generate meeting links for live classes. |
| FR-25 | In-app Messaging | The system shall allow messages/announcements between teachers and students. |
| FR-26 | Push Notifications | The mobile app shall send push notifications for updates and reminders. |

**2.7 Gamification**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-27 | Reward System | The system shall reward students with coins for completing tasks. |
| FR-28 | Leaderboard | The system shall display top students based on total points. |

**2.8 File Management**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-29 | File Upload | The system shall allow teachers to upload PDFs, videos, and notes securely. |
| FR-30 | File Storage | The system shall store structured data in PostgreSQL and files in MongoDB. |
| FR-31 | File Access Control | Only authorized users shall access relevant files. |

**2.9 Security & Session Management**

| **ID** | **Requirement** | **Description** |
| --- | --- | --- |
| FR-32 | JWT Tokens | All API calls shall be secured with JWT authentication. |
| FR-33 | Data Encryption | Passwords and sensitive data shall be encrypted using bcrypt. |
| FR-34 | Access Logs | The system shall log all login attempts and major actions. |