**1. Admin Business Logic**

**Responsibilities**: The Admin manages the platform's overall functionality, ensuring smooth operations.

**Core Business Logic:**

1. **User Management**:
   * Create, update, or delete user accounts (users table).
   * Assign roles to users (e.g., admin, lecturer, student) using role\_id.
   * Reset passwords for users.
2. **Course Management**:
   * Add, update, or deactivate courses (Course table).
   * Assign faculty (faculty\_id) and instructors (instructor\_id) to courses.
   * Define course capacity and monitor enrollment.
3. **System Monitoring**:
   * View reports on:
     + Enrollment statistics (enrollments table).
     + Test results (Test\_result table).
   * View user activity logs.
4. **Content Oversight**:
   * Approve or reject lesson materials (lessons table).
   * Moderate discussions (Discussion table) and remove inappropriate content.
5. **Platform Customization**:
   * Update platform settings (e.g., themes, notifications).
   * Manage announcements for users.

**2. Lecturer Business Logic**

**Responsibilities**:  
Lecturers handle course content, interact with students, and evaluate their progress.

**Core Business Logic:**

1. **Course Content Management**:
   * Create, update, and delete lessons (lessons table) for assigned courses.
   * Upload materials (e.g., PDFs, videos) and set the lesson sequence.
2. **Assessment Creation**:
   * Create and update tests (Test table) linked to lessons.
   * Define test duration, attempts allowed, and questions (Questions\_Answers table).
   * Add, update, or delete questions and answers.
3. **Student Interaction**:
   * Respond to discussions in the Discussion table.
   * Provide clarifications or additional guidance on lessons.
4. **Performance Monitoring**:
   * View test results (Test\_result table) for their courses.
   * Analyze student performance and provide feedback.
5. **Enrollment Management**:
   * Monitor enrolled students (enrollments table).
   * Manually adjust scores or statuses if needed.

**3. Student Business Logic**

**Responsibilities**:  
Students consume content, complete assessments, and interact with peers.

**Core Business Logic:**

1. **Enrollment**:
   * Browse available courses and enroll in them (enrollments table).
   * View their enrollment history and status.
2. **Course Consumption**:
   * Access lessons (lessons table) and materials for enrolled courses.
   * Mark lessons as completed.
3. **Assessments**:
   * Take tests (Test table) within the allowed duration and attempts.
   * View test results (Test\_result table) and feedback.
4. **Discussion Participation**:
   * Start or participate in discussions (Discussion table).
   * Like or reply to other students’ or lecturers’ posts.
5. **Profile Management**:
   * Update personal information and profile pictures (users table).
   * Change passwords securely.
6. **Progress Tracking**:
   * View their overall progress in courses (completed lessons, scores, etc.).
   * Monitor scores and achievements from tests.

**Shared Business Logic Across Roles**

1. **Authentication & Authorization**:
   * All roles must log in using credentials stored in the users table.
   * Access control is based on the role\_id in the users table.
2. **Notifications**:
   * Each role receives notifications relevant to their responsibilities:
     + Admins: System alerts (e.g., low course capacity).
     + Lecturers: Enrollment updates, discussion mentions.
     + Students: New course announcements, test deadlines.

**Implementation Suggestions**

1. **Role-Based Access Control (RBAC)**:
   * Use role\_id to grant or restrict access to specific features.
   * For example:
     + **Admin**: Full access.
     + **Lecturer**: Access only to their assigned courses.
     + **Student**: Access only to their enrolled courses.
2. **Validation Rules**:
   * Ensure courses cannot exceed capacity during enrollment.
   * Validate test attempts against attempts\_allowed.
3. **Logging and Auditing**:
   * Track actions like course creation, test submissions, and discussions for all roles.
   * Maintain an audit trail for sensitive actions like score changes or user deletions.
4. **Error Handling**:
   * Notify users if they try to access restricted content or exceed their role's limits.
   * Graceful handling of failed actions like test submissions or enrollment conflicts.