📚 LMS — ERD

👤 Roles

Purpose: Define permissions in the system

Fields

- 🔑 `role_id` (PK)
- 🏷️ `name` (UNIQUE) → admin / librarian / member
- 📝 `description`

Notes

- One role can belong to many users
- Roles rarely change

👤 Users

Purpose: Store all system users

Fields

- 🔑 `user_id` (PK)
- 🔗 `role_id` (FK → Roles.role_id)
- 👤 `full_name`
- 📧 `email` (UNIQUE)
- 🔐 `password_hash`
- ⚙️ `status` → active / suspended
- 📅 `created_at`

Rules

- Email must be unique
- Suspended users cannot borrow books

🏷️ Categories

Purpose: Group books logically

Fields

- 🔑 category_id (PK)
- 🏷️ name (UNIQUE)
- 📝 description

Rules

- A category can have many books
- A book belongs to one category (Phase 1)

📚 Books

Purpose: Store all book information

Fields

- 🔑 book_id (PK)
- 🔗 category_id (FK → Categories.category_id)
- 🔢 isbn (UNIQUE)
- 📖 title
- ✍️ author
- 📦 total_copies
- 📦 available_copies
- ⚙️ status → available / unavailable
- 📅 created_at

Rules

- available_copies ≤ total_copies
- Book cannot be deleted if borrowed

🔄 Borrow Records

Purpose: Track borrowing history

Fields

- 🔑 `borrow_id` (PK)
- 🔗 `user_id` (FK → Users.user_id)
- 🔗 `book_id` (FK → Books.book_id)
- 📅 `borrowed_at`
- 📅 `due_at`
- 📅 `returned_at` (nullable)
- ⚙️ `status` → borrowed / returned / overdue

Rules

- One borrow record = one user + one book
- `returned_at = NULL` → book still borrowed

💰 Fine Records (Optional / Derived)

Purpose: Track penalties for late returns

Fields

- 🔑 `fine_id` (PK)
- 🔗 `borrow_id` (FK → BorrowRecords.borrow_id) **UNIQUE**
- 💵 `amount`
- 💳 `paid_amount`
- ⚙️ `status` → unpaid / partial / paid / waived
- 📅 `created_at`
- 📅 `paid_at` (nullable)

Rules

- One borrow record → max one fine
- Borrowing blocked if unpaid fines exceed limit

🔗 Relationships (ERD View)

Core Relationships

- **Roles (1) → Users (Many)**

- **Categories (1) → Books (Many)**

- **Users (1) → Borrow Records (Many)**

- **Books (1) → Borrow Records (Many)**

- **Borrow Records (1) → Fine Records (0..1)**