Library Management System - Diagrams

DFD - Context Level (Level 0)

External Entities: Student, Librarian

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[ Student ] --> ( LMS System ) <-- [ Librarian ]
(LMS System) Processes: Manage Books, Issue/Return, Manage Users, Reports
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DFD - Level 1 (Major Processes)

Processes: 1) User Authentication 2) Search & Browse Books 3) Issue Book 4) Return Book 5) Manage Catalog 6) Reports

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[Student] -> (Search Books) -> [Book Catalog]
(Issue Book) -> [Transaction DB] <- (Return Book)
(Manage Catalog) -> [Book Catalog]
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ER Diagram (Entities & Key Attributes)

Entity	Attributes (PK in caps)
Student	STUDENT_ID (PK), name, email, phone, enrolled_date
Librarian	LIB_ID (PK), name, email
Book	BOOK_ID (PK), title, author, isbn, category, copies_total, copies_available
Transaction	TRANS_ID (PK), STUDENT_ID (FK), BOOK_ID (FK), issue_date, due_date, return_date,
Category	CAT_ID (PK), name, description

Relationships:

Student 1 - * Transaction (A student can have multiple transactions)

Book 1 - * Transaction (A book can be issued many times)

Category 1 - * Book (Each book belongs to one category)

UML Use Case Diagram (Textual)

Actors: Student, Librarian

- Login/Logout
- Search Books
- View Book Details
- Issue Book
- Return Book
- Reserve Book
- Manage Catalog (Add/Update/Delete Book) [Librarian]
- Manage Users [Librarian]
- Generate Reports [Librarian]

Sequence Diagram - Issue Book (Textual Lifeline)

Student -> System: Search & select Book Student -> System: Request Issue System -> Auth Service: Verify Student Auth Service -> System: Auth OK System -> Catalog: Check availability Catalog -> System: Available System -> Transaction DB: Create Issue Transaction System -> Book Catalog: Decrement available copies System -> Student: Confirm issue (issue_date, due_date)

Activity Diagram - Issue Book

1. Start
2. Student logs in
3. Search/select book
4. Check book availability
5. If available -> Create transaction & update copies
6. If not available -> Offer reservation
7. End

Class Diagram (Simplified)

Class	Attributes	Methods
User	userId, name, email	login(), logout()
Student (extends User)	studentId, enrollmentNo	requestIssue(), viewHistory()
Librarian (extends User)	libId	addBook(), updateBook(), generateReport()
Book	bookId, title, author, isbn, copiesAvailable	checkAvailability()
Transaction	transId, issueDate, dueDate, returnDate, fine	calculateFine(), closeTransaction()