

POSTGRESQL Project II

# University Library System

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*Figure 1. One of the largest Library in the world*

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# **TEST EXECUTION**

## **1. Project Implementation Stages**

### **A. University library domain analysis :**

Before unfurling the sails of innovation, let's anchor ourselves in the library's present reality. Here are the existing operations we've charted from a university standard library management system:

#### **1) Book Management:**

- a. Perform by adding, modifying, and deleting books manually.
- b. Tracking available copies and their locations is still done manually.

#### **2) Member Management:**

- a. Member registration is done on card paper.
- b. Management of member information (names ... etc).

### **3) Loan and Returns with penalties:**

- a. Registration of book loans is done.
- b. Monitoring return dates and handling delays with the associated penalties.
- c. Updating inventory upon returns.

### **4) Statistics and Reports:**

- a. Generating usage reports.
- b. Borrowing statistics by period, user, etc.

## **Areas of Improvement: Navigating Toward Efficiency**

Our theoretical information system sets sail with a compass calibrated for progress. Here's where we'll make waves:

### **1. Streamlined Book Management:**

- a. Our system will automate book additions, modifications, and deletions.
- b. The system will be able to swiftly locate available copies of books and manage stock.

### **2. Efficient Member Management:**

- a. Registration processes will be seamless, ensuring accurate user data.
- b. Borrowing and reservation management will flow seamlessly.

### **3. Real-Time Loans and Returns Tracking:**

- a. No more lost books in the Bermuda Triangle! Real-time tracking keeps borrowers on course.

## **2. Functional and Technical Specifications for a University Library Management System**

This specification describes the functional and technical requirements for a university library management system. The system is intended to optimize book stock management, track borrowings and returns in real time, and provide usage statistics.

## I. Project objectives

- Optimize book inventory management.
- Track books borrowed and returned in real time.

## II. Functional requirements

### A. Book Management

- **Add a Book:** Add new books with detailed information ( title, author, category, publication date, etc.).
- **Modify a Book:** Allows you to modify the information of an existing book.
- **Delete Book:** Allows you to delete a book from the catalog.
- **Search Books:** Allows you to search for books by various criteria (title, author, ISBN, category).

### B. Borrowing and returns management

- **Register Borrowing:** Allows members to register borrowing.
- **Register a Return :** Allows you to record the return of borrowed books.
- **Renew Borrowing:** Renew borrowing if no reservation is pending.
- **Manage Late Returns:** Track late returns and apply fines if necessary.

### C. Member management

- **Register Member:** Enable registration of new members (students, teachers, staff).
- **Modify Member:** Allows existing members' information to be modified.
- **Delete Member:** Allows members to be deleted from the system.
- **View a Member's Profile:** Display a member's personal information and borrowing history.

### D. Reservation management

- **Book Reservation:** Allows members to reserve unavailable books.

- Book management
- User management
- Loan management
- Return management

## I. Book management.

The book registration process below involves entering information about a book, checking that the information entered is correct and registering the book in the database.

**SELECT \* FROM public.books**

**ORDER BY id ASC**

Data Output Messages Notifications					
Showing rows: 1 to 31 Page No: 1 of 1					
	id [PK] integer	title character varying (255)	author character varying (255)	category character varying (255)	number_of_copies integer
1	1	lord of rings	nathan	action	2
2	2	The Great Gatsby	F. Scott Fitzgerald	Classic	12
3	3	To Kill a Mockingbird	Harper Lee	Classic	15
4	4	1984	George Orwell	Dystopian	10
5	5	Pride and Prejudice	Jane Austen	Romance	8
6	6	The Catcher in the Rye	J.D. Salinger	Classic	7
7	7	The Hobbit	J.R.R. Tolkien	Fantasy	10
8	8	Moby Dick	Herman Melville	Adventure	5
9	9	The Lord of the Rings	J.R.R. Tolkien	Fantasy	9
10	10	Jane Eyre	Charlotte Bronte	Romance	12
11	11	Animal Farm	George Orwell	Political Satire	13
12	12	War and Peace	Leo Tolstoy	Historical	6
13	13	The Odyssey	Homer	Epic	11
14	14	Ulysses	James Joyce	Modernist	8
15	15	The Divine Comedy	Dante Alighieri	Epic	7
16	16	Brave New World	Aldous Huxley	Dystopian	14
17	17	Les Misérables	Victor Hugo	Historical	10
18	18	Crime and Punishment	Fyodor Dostoevsky	Psychological	9
19	19	Wuthering Heights	Emily Bronte	Romance	8
20	20	The Iliad	Homer	Epic	11
21	21	The Brothers Karamazov	Fyodor Dostoevsky	Philosophical	5
22	22	Anna Karenina	Leo Tolstoy	Romance	12
23	23	The Metamorphosis	Franz Kafka	Absurdist	7
24	24	One Hundred Years of Solitude	Gabriel Garcia Marquez	Magic Realism	9

Let's us try to add a Book

```
/usr/lib/jvm/java-11.0-openjdk-amd64/bin/java -javaagent:/snap/intellij-idea-ultimate/557/lib/idea_rt.jar=35485:/snap/intellij-idea-ultimate/557/bin -Dfile.encoding=UTF-8
Connected to the PostgreSQL database.
Welcome to my Advanced Library Management application.

Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 1
Enter book ID: 32
Enter title: The Choice to live
Enter author: Boutchouang Nathan
Enter category: Leadership
Enter number of copies: 15
```

```
13. Exit
Choose an option: 1
Enter book ID: 32
Enter title: The Choice to live
Enter author: Boutchouang Nathan
Enter category: Leadership
Enter number of copies: 15
Book added successfully.

Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option:
```

Let's print back the table to verify if the book was added

Data Output Messages Notifications					
Showing rows: 1 to 32 Page No: 1 of 1					
	id [PK] integer	title character varying (255)	author character varying (255)	category character varying (255)	number_of_copies integer
9	9	The Lord of the Rings	J.R.R. Tolkien	Fantasy	9
10	10	Jane Eyre	Charlotte Bronte	Romance	12
11	11	Animal Farm	George Orwell	Political Satire	13
12	12	War and Peace	Leo Tolstoy	Historical	6
13	13	The Odyssey	Homer	Epic	11
14	14	Ulysses	James Joyce	Modernist	8
15	15	The Divine Comedy	Dante Alighieri	Epic	7
16	16	Brave New World	Aldous Huxley	Dystopian	14
17	17	Les Misérables	Victor Hugo	Historical	10
18	18	Crime and Punishment	Fyodor Dostoevsky	Psychological	9
19	19	Wuthering Heights	Emily Bronte	Romance	8
20	20	The Illiad	Homer	Epic	11
21	21	The Brothers Karamazov	Fyodor Dostoevsky	Philosophical	5
22	22	Anna Karenina	Leo Tolstoy	Romance	12
23	23	The Metamorphosis	Franz Kafka	Absurdist	7
24	24	One Hundred Years of Solitude	Gabriel Garcia Marquez	Magic Realism	9
25	25	Don Quixote	Miguel de Cervantes	Adventure	14
26	26	The Trial	Franz Kafka	Absurdist	8
27	27	The Picture of Dorian Gray	Oscar Wilde	Philosophical	11
28	28	Catch-22	Joseph Heller	Satire	10
29	29	Great Expectations	Charles Dickens	Bildungsroman	7
30	30	The Grapes of Wrath	John Steinbeck	Historical	8
31	31	The Old Man and the Sea	Ernest Hemingway	Literary	6
32	32	The Choice to live	Boutchouang Nathan	Leadership	15

The book was successfully added

Let's update a book information

```

Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 2
Enter book ID to edit: 4
Enter new title: The Mentalist
Enter new author: Ulrich Cheriff
Enter new category: action
Enter new number of copies: 9
Book edited successfully.

```

Let's verify if the book was updated



Data Output Messages Notifications

	Id [PK] integer	title character varying (255)	author character varying (255)	category character varying (255)	number_of_copies integer
1	1	lord of rings	nathan	action	2
2	2	The Great Gatsby	F. Scott Fitzgerald	Classic	12
3	3	To Kill a Mockingbird	Harper Lee	Classic	15
4	4	The Mentalist	Ulrich Cheriff	action	9
5	5	Pride and Prejudice	Jane Austen	Romance	8
6	6	The Catcher in the Rye	J.D. Salinger	Classic	7
7	7	The Hobbit	J.R.R. Tolkien	Fantasy	10

Let's try to Delete a book

```

/usr/lib/jvm/java-1.11.0-openjdk-amd64/bin/java -javaagent:/snap/intellij-idea-ultimate/557/lib/idea_rt.jar=35293:/snap/intellij-idea-ultimate/557/bin -Dfile.encoding=UTF-8
Connected to the PostgreSQL database.
Welcome to my Advanced Library Management application.

Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 3
Enter book ID to delete: 5
Book and related loans deleted successfully.
Book deleted successfully.

```

Let's verify if the book with Id 5 was deleted

	id [PK] integer	title character varying (255)	author character varying (255)	category character varying (255)	number_of_copies integer
1	1	lord of rings	nathan	action	2
2	2	The Great Gatsby	F. Scott Fitzgerald	Classic	12
3	3	To Kill a Mockingbird	Harper Lee	Classic	15
4	4	The Mentalist	Ulrich Cheriff	action	9
5	6	The Catcher in the Rye	J.D. Salinger	Classic	7
6	7	The Hobbit	J.R.R. Tolkien	Fantasy	10
7	8	Moby Dick	Herman Melville	Adventure	5
8	10	Jane Eyre	Charlotte Bronte	Romance	12
9	11	Animal Farm	George Orwell	Political Satire	13
10	12	War and Peace	Leo Tolstoy	Historical	6
11	13	The Odyssey	Homer	Epic	11
12	14	Ulysses	James Joyce	Modernist	8
13	15	The Divine Comedy	Dante Alighieri	Epic	7
14	16	Brave New World	Aldous Huxley	Dystopian	14
15	17	Les Misérables	Victor Hugo	Historical	10
16	18	Crime and Punishment	Fyodor Dostoevsky	Psychological	9
17	19	Wuthering Heights	Emily Bronte	Romance	8
18	20	The Iliad	Homer	Epic	11
19	21	The Brothers Karamazov	Fyodor Dostoevsky	Philosophical	5
20	22	Anna Karenina	Leo Tolstoy	Romance	12
21	23	The Metamorphosis	Franz Kafka	Absurdist	7
22	24	One Hundred Years of Solitude	Gabriel Garcia Marquez	Magic Realism	9
23	25	Don Quixote	Miguel de Cervantes	Adventure	14

## II. Member Management

One of the main functionalities of our university library management system is the optimization of member management. This mainly involves the registration process for members of our library (students, teachers). To this end, when requesting registration, the member provides the registration form and is enrolled after verification of the conformity of the information.

**SELECT \* FROM public.members**

**ORDER BY id ASC**

Data Output Messages Notifications					
Showing rows: 1 to 31 Page No: 1 of 1					
	id [PK] integer	firstname character varying (255)	lastname character varying (255)	email character varying (255)	membership_date date
1	1	max	helles	maxhelles@gmail.com	2024-01-24
2	2	Doe	John	john.doe@example.com	2023-01-01
3	3	Smith	Jane	jane.smith@example.com	2023-02-15
4	4	Brown	Michael	michael.brown@example.com	2023-03-10
5	5	Johnson	Emily	emily.johnson@example.com	2023-04-05
6	6	Williams	Christopher	christopher.williams@example.com	2023-05-20
7	7	Jones	Amanda	amanda.jones@example.com	2023-06-25
8	8	Davis	Daniel	daniel.davis@example.com	2023-07-15
9	9	Garcia	Patricia	patricia.garcia@example.com	2023-08-30
10	10	Miller	Richard	richard.miller@example.com	2023-09-18
11	11	Wilson	Elizabeth	elizabeth.wilson@example.com	2023-10-01
12	12	Moore	David	david.moore@example.com	2023-11-11
13	13	Taylor	Linda	linda.taylor@example.com	2023-12-21
14	14	Anderson	Joseph	joseph.anderson@example.com	2024-01-12
15	15	Thomas	Barbara	barbara.thomas@example.com	2024-02-22
16	16	Jackson	Charles	charles.jackson@example.com	2024-03-01
17	17	White	Margaret	margaret.white@example.com	2024-04-17
18	18	Harris	Steven	steven.harris@example.com	2024-05-07
19	19	Martin	Sarah	sarah.martin@example.com	2024-06-27
20	20	Thompson	Paul	paul.thompson@example.com	2024-07-03
21	21	Garcia	Mark	mark.garcia@example.com	2024-08-15
22	22	Martinez	Nancy	nancy.martinez@example.com	2024-09-25
23	23	Robinson	Andrew	andrew.robinson@example.com	2024-10-08
24	24	Clark	Sandra	sandra.clark@example.com	2024-11-12

Let’s try to add a new member

```
Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 7
Enter member ID: 33
Enter First name: Boutchouang
Enter Last name: Nathan
Enter email: nathanboutchouang@gmail.com
Enter membership date (yyyy-mm-dd): 2025-01-15
Member registered successfully.
```

Let’s verify the new member added

	id [PK] integer	firstname character varying (255)	lastname character varying (255)	email character varying (255)	membership_date date
8	8	Davis	Daniel	daniel.davis@example.com	2023-07-10
9	9	Garcia	Patricia	patricia.garcia@example.com	2023-08-30
10	10	Miller	Richard	richard.miller@example.com	2023-09-18
11	11	Wilson	Elizabeth	elizabeth.wilson@example.com	2023-10-01
12	12	Moore	David	david.moore@example.com	2023-11-11
13	13	Taylor	Linda	linda.taylor@example.com	2023-12-21
14	14	Anderson	Joseph	joseph.anderson@example.com	2024-01-12
15	15	Thomas	Barbara	barbara.thomas@example.com	2024-02-22
16	16	Jackson	Charles	charles.jackson@example.com	2024-03-01
17	17	White	Margaret	margaret.white@example.com	2024-04-17
18	18	Harris	Steven	steven.harris@example.com	2024-05-07
19	19	Martin	Sarah	sarah.martin@example.com	2024-06-27
20	20	Thompson	Paul	paul.thompson@example.com	2024-07-03
21	21	Garcia	Mark	mark.garcia@example.com	2024-08-15
22	22	Martinez	Nancy	nancy.martinez@example.com	2024-09-25
23	23	Robinson	Andrew	andrew.robinson@example.com	2024-10-08
24	24	Clark	Sandra	sandra.clark@example.com	2024-11-12
25	25	Rodriguez	Joshua	joshua.rodriguez@example.com	2024-12-31
26	26	Lewis	Karen	karen.lewis@example.com	2025-01-14
27	27	Lee	Brian	brian.lee@example.com	2025-02-28
28	28	Walker	Carol	carol.walker@example.com	2025-03-15
29	29	Hall	Kevin	kevin.hall@example.com	2025-04-05
30	30	Allen	Laura	laura.allen@example.com	2025-05-20
31	31	Young	Edward	edward.young@example.com	2025-06-25
32	32	Boutchouang	Nathan	nathanboutchouang@gmail.com	2025-01-15

Let's try to search out the books by Title

```

Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 4
Enter title: lord of rings
Book found: lord of rings by nathan

```

### III. Loan Management

The process of borrowing a book begins with the search for the book to be borrowed, verification of its availability and registration of the loan.

Let's add a loan

```
Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 10
Enter loan ID: 32
Enter member ID: 10
Enter book ID: 20
Enter loan date (yyyy-mm-dd): 2024-01-15
Enter return preview date (yyyy-mm-dd): 2024-01-20
Loan recorded successfully.
```

### IV. Return Management

The book return process takes two situations into account:

- if the book is returned on time, the return is recorded without penalty;
- and the case where the book is returned late, and late penalties must be applied,

Let's manage a book return

```
Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 11
Enter loan ID to manage return: 32
Enter actual return date (yyyy-mm-dd): 2025-01-11
Return managed successfully.
```

## Let's now the penalties

```
Library Management System
1. Add Book
2. Edit Book
3. Delete Book
4. Search Book by Title
5. Search Book by Category
6. Show All Available Books
7. Register Member
8. Delete Member
9. Search Member by Name
10. Record Loan
11. Manage Return
12. Calculate Penalties
13. Exit
Choose an option: 12
Loan ID: 1 is 2 days late. Penalty: 200 CFA.
Loan ID: 32 is 357 days late. Penalty: 35700 CFA.
```