# 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.

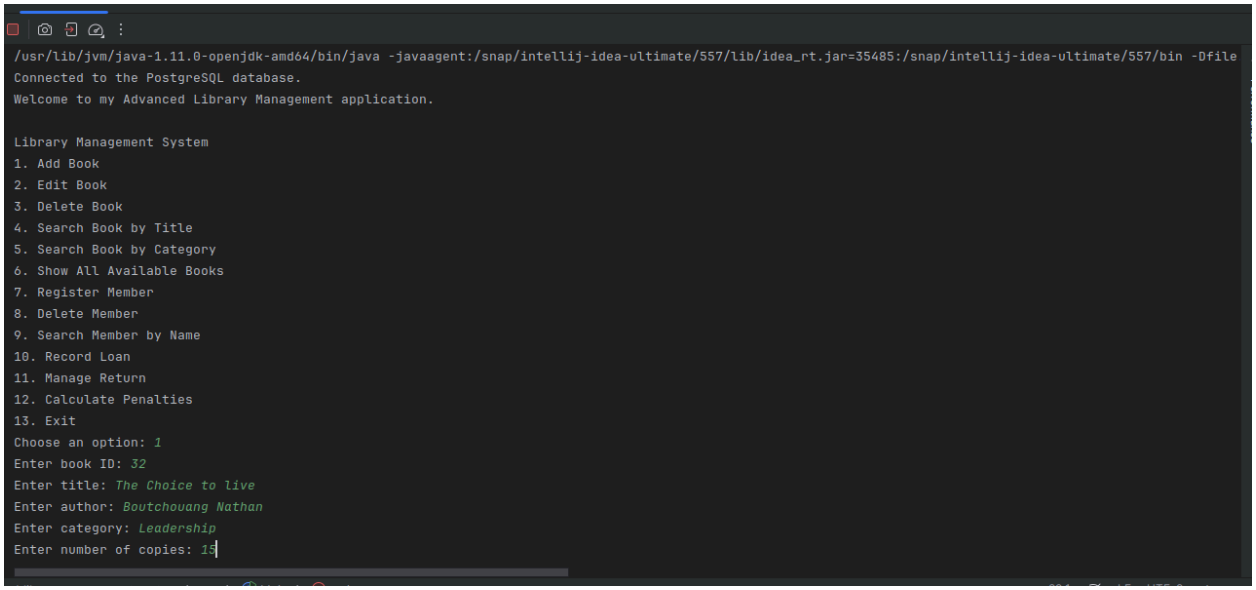
```
SELECT * FROM public.books

ORDER BY id ASC
```

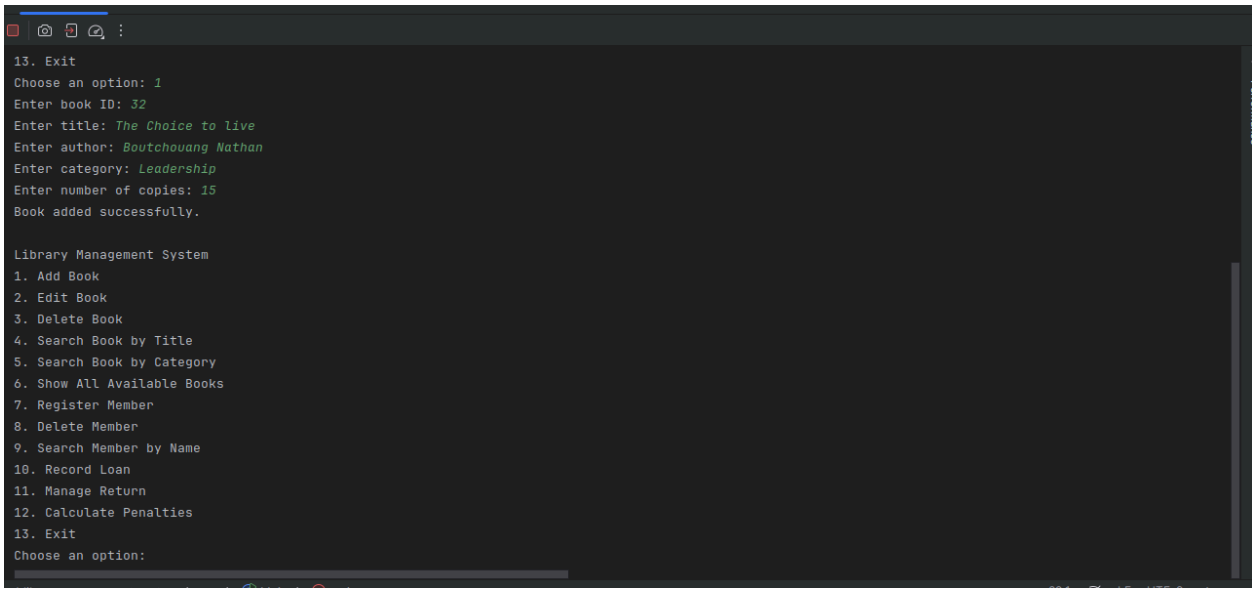
Data Output | Messages | Notifications

Showing rows: 1 to 31 | Page No: 1 of 1

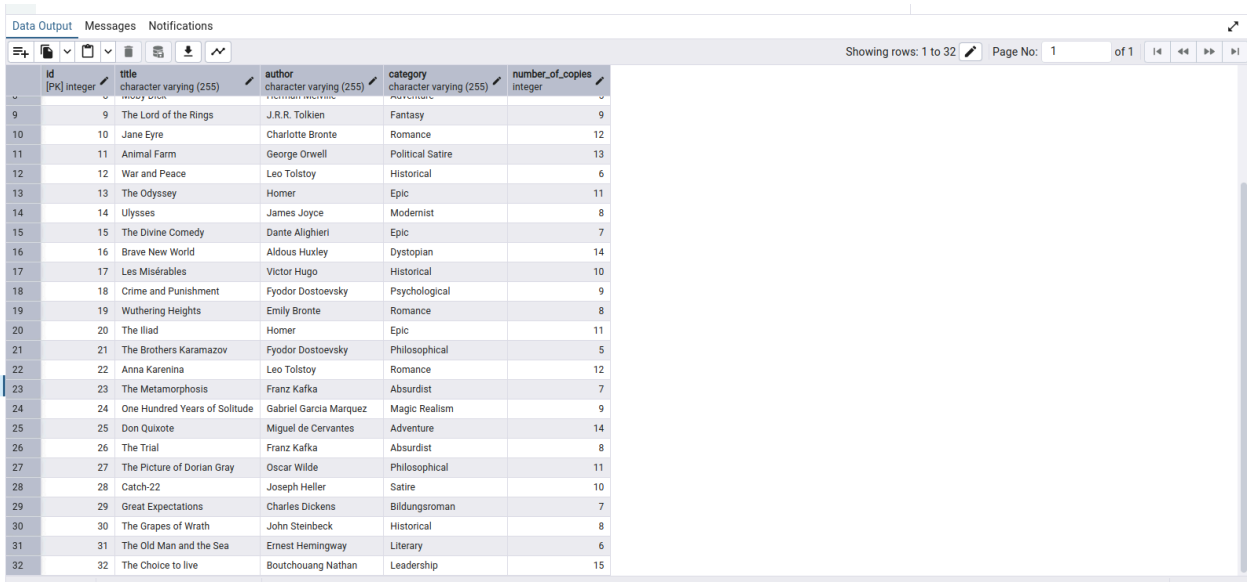
| | id [PK] integer | title character varying (255) | author character varying (255) | category character varying (255) | number_of_copies integer |
|---|---|---|---|---|---|
| 1 | 1 | lord of rings | nathan | action | 2 |
| 2 | 2 | The Great Gatsby | F. Scott Fitzgerald | Classic | 12 |
| 3 | 3 | To 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




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 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 |
| 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
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: 9
Book and related loans deleted successfully.
Book deleted successfully.
```

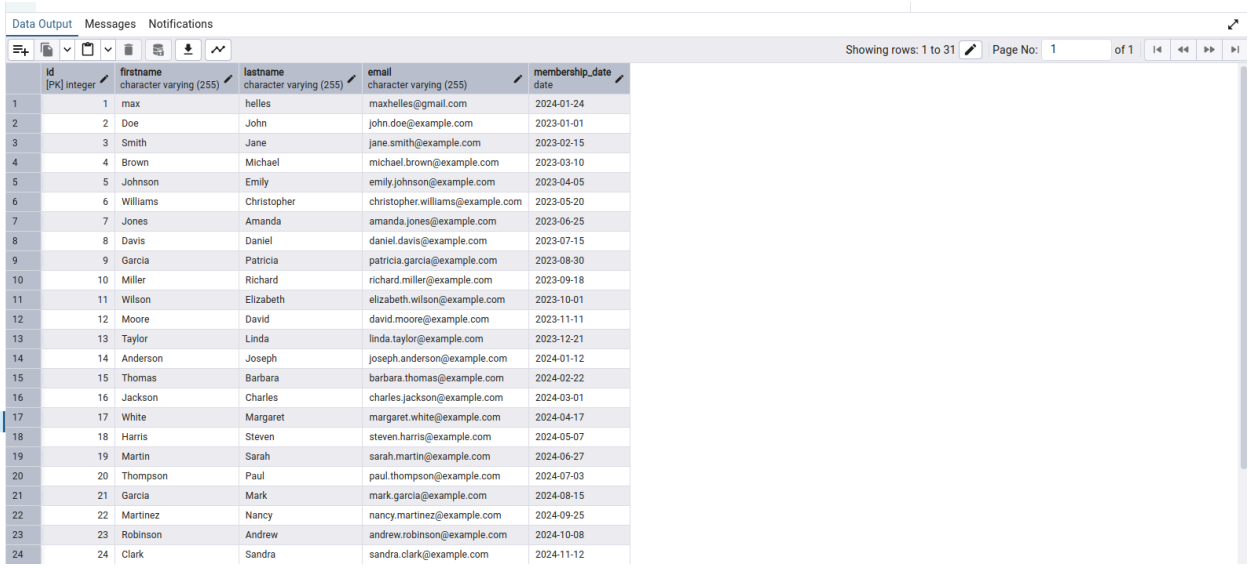
Let’s verify if the book with Id 5 was deleted

| | 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 |
|---|---|---|---|---|---|
| 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.
```