SEN22105E

Computer Programming I Laboratory

Project

Final date to submit is 08/01/2025

You are tasked with developing a simple Library Management System to help a librarian manage books, users, and borrowing transactions. The program should allow the librarian to add books, register users, manage borrowing and returning, and view transaction details.

Classes to Implement

1. Book:
    - Title (String).
    - Author (String).
    - Available Copies (int). A book cannot be borrowed if no copies are available.
    - Total Copies (int).
2. User:
    - Name (String).
    - Email (String).
    - Borrowed Books (Array of Book objects). A user can't borrow more than 3 books at a time.
3. Transaction:
    - User object.
    - Book object.
    - Transaction Type (String: "Borrow" or "Return").
    - Transaction Date (String or Date object).
4. Library:
    - Stores books in shelves.
        - Each shelf is represented as a book array and the shelves are represented in an array of array of books.
        - Each shelf have a capacity of 4 books.
        - Books will be searched, borrowed from and returned to these shelves.
        - When adding a book, if there is not enough shell space, a new shelf will be created by increasing array size.
    - Maintain a list of users, and transactions. Use arrays.
    - Add new book method. Two books can't have same title and author, add the necessary checks here.
    - Register new user method. Two users can't have same e-mail, add the necessary checks here.
    - Handle borrowing and returning books using methods. Ensure a book is available before borrowing.
    - Keep track of book availability and user borrowing records in methods.
    - Record all transactions.
5. Main:
   Contains the main method to interact with the system.
    - In the main method, display a menu for the librarian to:
        - Add books.
        - Register users.
        - Borrow books.
        - Return books.
        - Display all the books.
        - View all transactions.
        - Exit the program.

Program should start with 10 shelves.

Ensure proper validations and error messages are displayed.

Use at least 2 static variables.

Use suitable modifiers for variables and methods based on what we studied in the course.

Try to handle all types of errors that may occur from the user.

You should use comments to explain every function.

Your program should be friendly and easy to use.

Draw the UML diagrams for the created classes using any online tool and attach them to the project folder as images.

Example program routine is given below with user inputs displayed in bold. In this example not all menus are displayed here, you will need to design them yourselves. Also as long as you follow the general requirements, you can change the menu design to your preference.

Library Management System:
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **1**
Enter Book Title: **Java Programming Basics**
Enter Author: **John Smith**
Enter Total Copies: **5**
Book 'Java Programming Basics' by John Smith has been added with 5 copies.
Library Management System:
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **5**
Java Programming Basics, John Smith, 5 copies.
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **2**
Enter User Name: **Alice Brown**
Enter User Email: **alice@example.com**
User 'Alice Brown' has been registered.
Java Programming Basics, John Smith, 5 copies.
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **3**
Enter User Email: **alice@example.com**
Enter Book Title: **Java Programming Basics**
Enter Book Author: **John Smith**
Book 'Java Programming Basics' has been borrowed by Alice Brown.
Available Copies: 4
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book

5. Display all Books
5. View Transactions
6. Exit
Choose an option: **5**
Java Programming Basics, John Smith, 4 copies.
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **1**
Enter Book Title: **Java Programming Basics**
Enter Author: **John Smith**
Book Java Programming Basics already exists. Enter how many new copies to add.
Enter New Copies: **45**
Built 2 new shelves to accomodate new books.
Book 'Java Programming Basics' by John Smith has been added with 45 new copies.
1. Add a New Book
2. Register a New User
3. Borrow a Book
4. Return a Book
5. Display all Books
5. View Transactions
6. Exit
Choose an option: **6**
Program exited succesfully.