

BAHRIA UNIVERSITY KARACHI CAMPUS

DEPARTMENT OF COMPUTER ENGINEERING



Bahria University
Discovering Knowledge

LIBRARY MANAGEMENT SYSTEM

COMPUTER PROGRAMMING

CSL 113

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Acknowledgement

We would like to express our sincere gratitude to all those who have helped us in completing our library management system project in C++.

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We would also like to thank our classmates and friends, who helped us with their suggestions and feedback throughout the project. Their support and encouragement have been very invaluable to us.

Lastly, we would like to acknowledge the support and understanding of our families, who have always been there to support us in our academic pursuits.

We are grateful to all of you for your support and guidance, and we hope that our project will be of great use in the field of library management systems.

Abstract

The library management system project in C++ is a computer-based system that aims to automate the various processes involved in managing a library. The system is designed to handle the cataloguing, circulation, and inventory management of books in a library. The project is implemented using the C++ programming language and utilizes various data structures and algorithms to efficiently store and retrieve information.

The system allows for the registration of new members, the borrowing and returning of books, and the tracking of overdue items. It also includes a search feature that allows users to easily locate books according to their ids and check their availability.

Our project aims to provide an efficient and user-friendly solution for managing a library's resources and is expected to streamline the processes involved in managing a library, saving time and reducing errors.

List of Context

- Book management (adding, editing, deleting books)
- Member management (adding, editing, deleting members)
- Check-out and check-in of books
- Search functionality (search for books by title, author, ISBN)
- Generating reports (overdue books, most popular books)
- Fine calculation and management
- Authentication and authorization (login for librarians and members)
- Backup and restore functionality
- User interface (menu-based)
- Data storage and retrieval (using file handling)

Introduction

Library management systems are computer programs that help manage and organize a library's collection of books, periodicals, and other materials. They typically include features such as cataloging, circulation, and reporting. A library management system written in C++ would be a powerful and efficient tool for managing a library's collection. It would provide a user-friendly interface for librarians and patrons, and would be able to handle large amounts of data with ease. The system could include features such as searching for books, checking out and returning books, and generating reports on library usage. Overall, a C++ library management system would be a valuable asset to any library looking to improve its organization and efficiency.

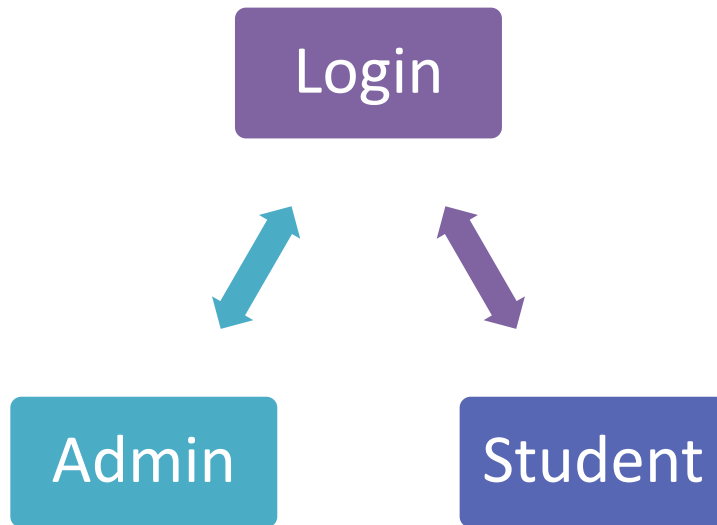
Overview of Project

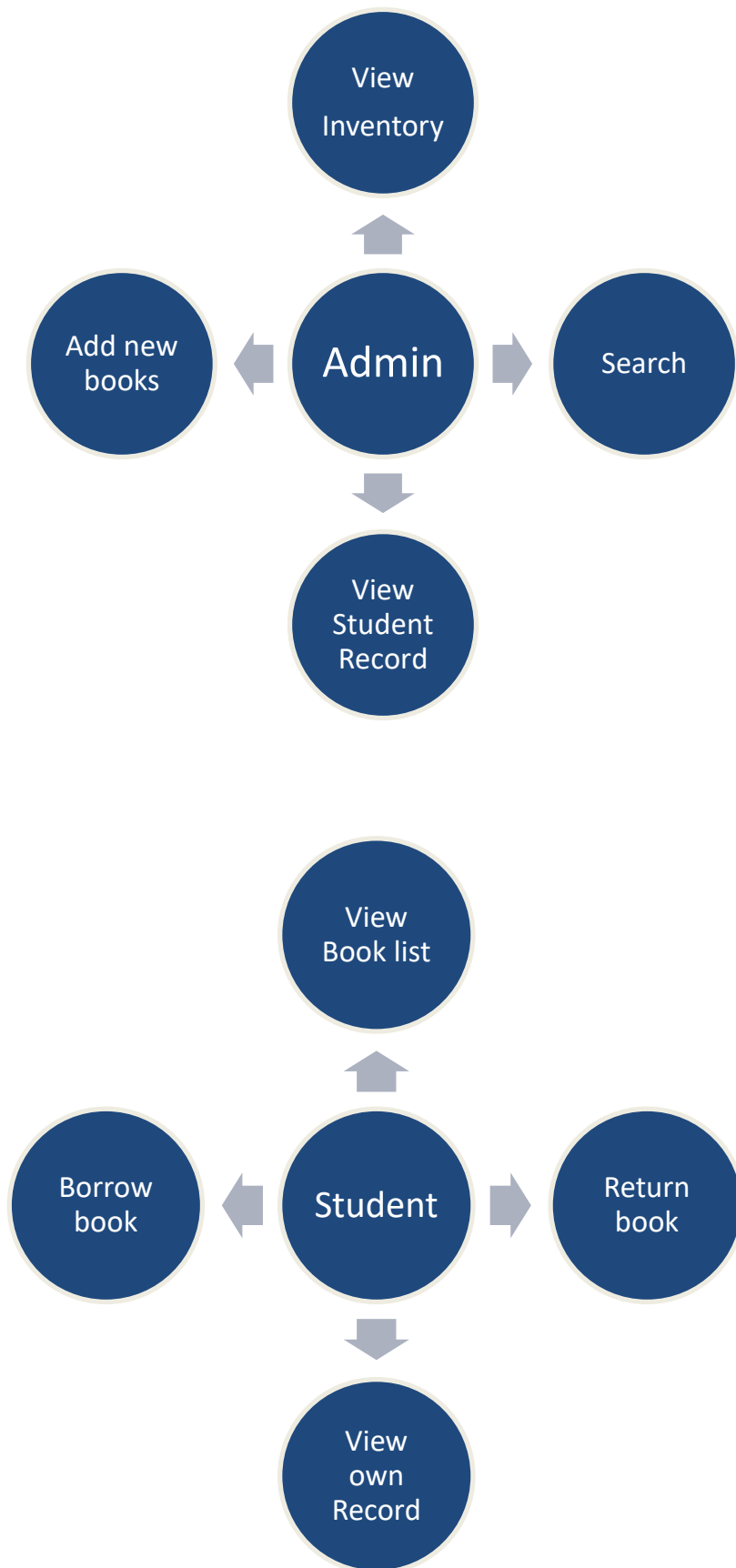
Our library management project manages and stores books information electronically. The system helps both students and library manager to keep a constant track of all the books available in the library. It allows both the admin and the student to search for the desired book. It becomes necessary for libraries to keep a continuous check on the books issued and returned and even calculate fine. This task if carried out manually will be tedious and includes chances of mistakes. These errors are avoided by allowing the system to keep track of information such as issue date, last date to return the book and even fine information and thus there is no need to keep manual track of this information which thereby avoids chances of mistakes. Thus this system reduces manual work to a great extent allows smooth flow of library activities by removing chances of errors in the details.

Modules:

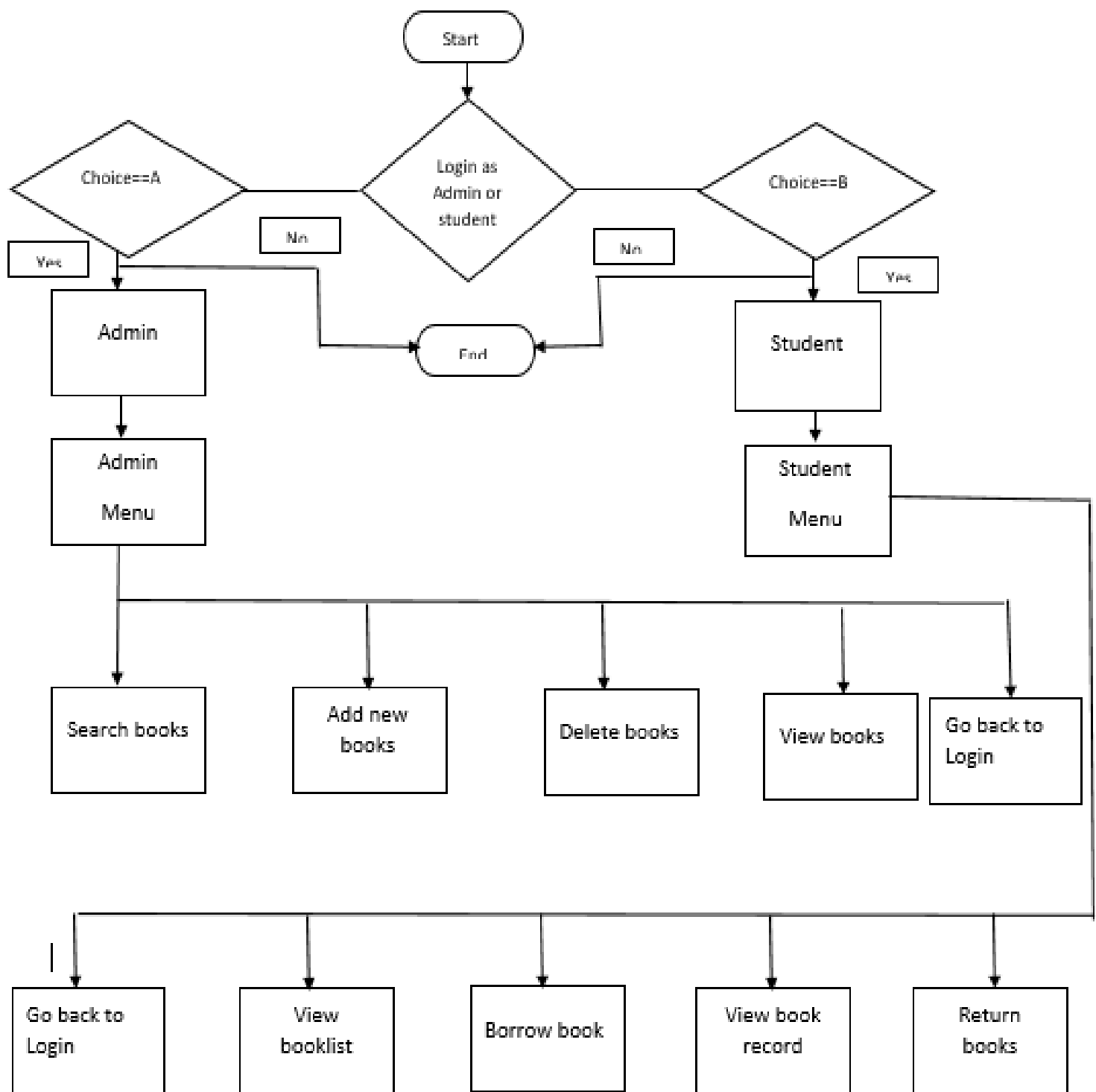
- **Admin login:** Admin is the one who administers the system by adding or removing e-books into and from the system respectively.
- **User login:** Students have to register themselves into the system to create an account. After registering successfully, they can then login into the system by entering 10 digit mobile number and their email id.
- **Add and Update Books:** The admin can add books to the system by entering the details of the books and can even update the details.
- **Search option:** Admin and Students can even search for books by entering the name of the book.
- **Borrow Book-** The students can borrow books and simultaneously the quantity of the book borrowed will be decremented.
- **Calculate Fine-** The student can view the issue and expiry date for the book issued and can even calculate fine.

Workflow





Flowchart



Problems and Solutions

Here are some problems that might arise during the development of a library management system project in C++, and some potential solutions:

Data entry errors: Librarians or patrons may accidentally enter incorrect information when adding or updating books in the system. To mitigate this, the system could include validation checks to ensure that the data entered is accurate and in the correct format.

Searching for books: The system would need to provide an efficient way for librarians and patrons to search for books by title, author, or other criteria. One solution could be to implement a full-text search engine that allows for fast and accurate searching of the library's collection.

Keeping track of books: The system would need to keep track of which books are currently checked out and by whom, as well as when they are due to be returned. One solution could be to implement a system of fines for overdue books, and to send reminders to patrons when their books are due.

Generating reports: Librarians would need to be able to generate reports on library usage, such as which books are most frequently checked out, which patrons have the most overdue books, and other similar statistics. One solution could be to implement a reporting module that allows librarians to generate these reports quickly and easily.

Security: The system should be able to protect the library's data from unauthorized access and potential data breaches. One solution could be to implement a system of user authentication and role-based access control, so that only authorized users can access sensitive information.

User Experience: The system should be user-friendly and easy to navigate. One solution could be to conduct user testing and gather feedback to improve the overall user experience.

Output

Upon starting the program, user will be given options to login.

```
Project\x64\Debug\CP Final Project.exe
*****
                                BAHRIA VIRTUAL LIBRARY
*****

>> Choose an option to login
Press A if you are an admin.
Press B if you are a registered student.
Press C if you would like to register now.
Press X to exit.          A

Login Code: fguihf
Invalid code. Enter again: library123

----- ADMINISTRATIVE MENU -----

1. View inventory.
2. Add a new book.
3. Search in inventory.
4. View student record.
5. Go back to login page.

Enter your choice:
```

If user chooses **admin**, they will be asked to enter the login code and then shown the admin menu.

Admin chooses to view inventory.

Enter your choice: 1

INVENTORY				
ID	Name of Book	Name of Author	Status	Quantity
0001	To Kill a Mockingbird	Harper Lee	Available	3
0002	The Kite Runner	Khaled Hussein	Available	6
0003	Divergent	Veronica Roth	Available	9
0004	The Fault in Our Stars	John Green	Available	2
0005	It Ends with Us	Colleen Hoover	Available	4
0006	The Forty Rules of Love	Elif Shafak	Available	7
0007	Love Letters to the Dead	Ava Dellaira	Available	8
0008	Nineteen Eighty-Four	George Orwell	Available	2
0009	Invisible Man	Ralph Ellison	Available	5
0010	The Silent Patient	Alex Michaelides	Available	3

Press Y to go back to menu. Y

----- ADMINISTRATIVE MENU -----

1. View inventory.
2. Add a new book.
3. Search in inventory.
4. View student record.
5. Go back to login page.

After viewing inventory admin can go back to the menu and choose another option.

Admin chooses to add a new book.

Please enter the details of the book you want to add.

Name of book: Harry Potter

Name of author: JK Rowling

Quantity to be added: 12

Loading...

_____ @!

The book has been added to record. Press Y to go back to menu. Y

Admin will be asked to provide information regarding the new book and add it to record.

Admin views inventory again

INVENTORY				
ID	Name of Book	Name of Author	Status	Quantity
0001	To Kill a Mockingbird	Harper Lee	Available	3
0002	The Kite Runner	Khaled Husseini	Available	6
0003	Divergent	Veronica Roth	Available	9
0004	The Fault in Our Stars	John Green	Available	2
0005	It Ends with Us	Colleen Hoover	Available	4
0006	The Forty Rules of Love	Elif Shafak	Available	7
0007	Love Letters to the Dead	Ava Dellaira	Available	8
0008	Nineteen Eighty-Four	George Orwell	Available	2
0009	Invisible Man	Ralph Ellison	Available	5
0010	The Silent Patient	Alex Michaelides	Available	3
0011	Harry Potter	JK Rowling	Available	12

The new book that the admin added will now be included in the inventory.

Admin searches for a book

```
Enter your choice: 3

Please enter the id of the book you want to search: 0021

- - - - -
Loading...
                                     @!

Invalid ID, this book is not in our record.      Press Y to go back to menu. Y
```

Admin will be asked to search by id and if the book is not in inventory, it will display invalid id.

```
Please enter the id of the book you want to search: 0007

- - - - -
Loading...
                                     @!

Love Letters to the Dead by Ava Dellaira
Status = Available      Quantity = 8      Press Y to go back to menu. Y
```

If the book is found in inventory, it will display its name and tell availability status.

Admin chooses to view student information

```
Enter your choice: 4

                                STUDENT DATA

1. View personal information
2. View library information
3. Search for a specific student
4. Go back to menu

Enter your choice: 1
```

Admin will be displayed another menu with choices regarding what kind of student information they want to see.

Admin searches for a specific student

```
Enter student ID: 1210

Loading...
[Progress Bar]                               @!

-----

ID:                1210
Name:              Hafsa Khattak
Father's name:     Khattak Hussain
Email:             hafsa.k@gmail.com
Phone:             03327819731
Password:          oqw1r
Book borrowed:     Nineteen Eighty-Four
Issue date:        25/12/2022
Return date:       5/ 1/2023

-----
```

Admin will be asked to enter student ID, if the student is in record, it will display their information.

Admin chooses to view personal information

```
Currently registered students

ID:          1216
Name:        Naveen Zaman Khan
Father's name: Khurram Zaman Khan
Email:       naveen.zkhan@gmail.com
Phone:       033406719256
Password:    xts4m

-----

ID:          1291
Name:        Aiman Yousuf
Father's name: Yousuf Ahmed
Email:       aiman.lodhi@gmail.com
Phone:       03317281902
Password:    pvyw2

-----

ID:          1210
Name:        Hafsa Khattak
Father's name: Khattak Hussain
Email:       hafsa.k@gmail.com
Phone:       03327819731
Password:    oqw1r

-----

ID:          1264
Name:        Nahin Fatima
Father's name: Bilal Faisal
Email:       nahin_fatima@gmail.com
Phone:       033172893561
Password:    gr4kw

-----
```

Personal information regarding all currently registered students will be displayed.

Admin chooses to view library information

```
Enter your choice: 2

ID:          1216
Name:        Naveen Zaman Khan
Book borrowed: None
Issue date:  00/00/0000
Return date: 00/00/0000

-----

ID:          1291
Name:        Aiman Yousuf
Book borrowed: The Forty Rules of Love
Issue date:  12/ 4/2022
Return date:  22/ 4/2022

-----

ID:          1210
Name:        Hafsa Khattak
Book borrowed: Nineteen Eighty-Four
Issue date:  25/12/2022
Return date:  5/ 1/2023

-----

ID:          1264
Name:        Nahin Fatima
Book borrowed: None
Issue date:  00/00/0000
Return date:  00/00/0000

-----

ID:          1297
Name:        Alishba Siraj
Book borrowed: Invisible Man
Issue date:  18/ 3/2022
Return date:  28/ 3/2022

-----
```

Library information regarding all currently registered students will be displayed.

Admin exits the program

```
STUDENT DATA

1. View personal information
2. View library information
3. Search for a specific student
4. Go back to menu

Enter your choice: 4

----- ADMINISTRATIVE MENU -----

1. View inventory.
2. Add a new book.
3. Search in inventory.
4. View student record.
5. Go back to login page.

Enter your choice: 5

>> Choose an option to login
Press A if you are an admin.
Press B if you are a registered student.
Press C if you would like to register now.
Press X to exit.      X

C:\Users\navve\Desktop\CP Final Project\x64\Debug\CP Final Project.exe (process 9424) exited with code 0.
```

User is a new member and chooses to register

```
x64\Debug\CP Final Project.exe
*****
                                BAHRIA VIRTUAL LIBRARY
*****

>> Choose an option to login
Press A if you are an admin.
Press B if you are a registered student.
Press C if you would like to register now.
Press X to exit.          C

Fill in the form below to register.

Name: Aiman Yousuf
Father's name: Yousuf Lodhi
Email: aiman.lodhi@gmail.com
Phone Number : +92 3347892673

Please wait while your account is being made.
Loading...
Dear Aiman Yousuf you have been registered successfully.
Your login code is: ivpv6
You can now access all library features.          Press any key to continue . . .

----- STUDENT MENU -----
```

User will be asked to enter their information and then given an automatically generated code to login the next time they open the program.

User chooses to login as a registered student

```
*****
                                BAHRIA VIRTUAL LIBRARY
*****

>> Choose an option to login
Press A if you are an admin.
Press B if you are a registered student.
Press C if you would like to register now.
Press X to exit.          B

Enter your login code: xts4m

Loading...
[Progress Bar]           @!

----- STUDENT MENU -----

1. View book list.
2. Borrow a book.
3. Return a book.
4. View your record.
5. Go back to login page.
```

Student will be asked to enter login code. If the code is correct, student menu is displayed.

Student chooses to view book list

```

Enter your choice: 1

BOOK LIST

ID          Name of Book          Name of Author          Status
-----
0001        To Kill a Mockingbird    Harper Lee              Available
0002        The Kite Runner         Khaled Hosseini         Available
0003        Divergent               Veronica Roth            Available
0004        The Fault in Our Stars  John Green              Available
0005        It Ends with Us         Colleen Hoover          Available
0006        The Forty Rules of Love Elif Shafak             Available
0007        Love Letters to the Dead Ava Dellaira            Available
0008        Nineteen Eighty-Four   George Orwell           Available
0009        Invisible Man           Ralph Ellison            Available
0010        The Silent Patient      Alex Michaelides        Available

Press Y to go back to menu. Y

----- STUDENT MENU -----

```

Student will be shown all the books in inventory and their availability status.

Student chooses to borrow a book

```
Pls view your desired book in the book list and enter its ID.  
If you do not remember the ID, Press 1 to go back to menu or else press 2 to continue. 2  
  
ID: 0009  
  
Please wait while the book is being added to your record.  
  
Loading...  
[Progress bar] @!  
  
You have borrowed Invisible Man by Ralph Ellison successfully.  
  
Please enter today's date(dd mm yyyy): 23 04 2022  
  
You can only keep this book for 10 days. Must return on 3/5/2022      Press Y to go back to menu. Y
```

Student will be asked to enter the id of the book they want to borrow, they can go back to the book list if they do not remember the id.

After the book is borrowed, they will be asked to enter the date so that their return date can be generated.

```
1. View book list.
2. Borrow a book.
3. Return a book.
4. View your record.
5. Go back to login page.

Enter your choice: 2

You can only borrow 1 book at a time. You must return The Forty Rules of Love first. Press Y to go back to menu. Y
```

Student can only borrow one book at a time. If they already have a book in record, they will be asked to return the previous one first.

Student chooses to return a book

```
You currently have The Forty Rules of Love in your record.
Press R to return it: R

Please enter today's date(dd mm yyyy): 24 12 2022

Please wait while the book is being removed from your record.

Loading...
[Progress Bar] @!

You have exceeded the due date. You are fined $50. Press Y to go back to menu. Y
```

Student will be asked to enter the date which will be compared with the return date generated during time of borrow. If the date has been exceeded, a fine will be generated.

```
Enter your choice: 3

You dont have any book in your record. Press Y to go back to menu. Y
```

If student has no book in their record, return book option will not be processed for them.

Student chooses to view their own record

```
-----  
ID: 1216  
Name: Naveen Zaman Khan  
Father's name: Khurram Zaman Khan  
Email: naveen.zkhan@gmail.com  
Phone: 033406719256  
Password: xts4m  
Book borrowed: Invisible Man  
Issue date: 23/ 4/2022  
Return date: 3/ 5/2022  
-----  
P
```

The login code used by the student to login will be compared with the data stored and then information regarding the student will be displayed.

Student exits the program

```
----- STUDENT MENU -----  
  
1. View book list.  
2. Borrow a book.  
3. Return a book.  
4. View your record.  
5. Go back to login page.  
  
Enter your choice: 5  
  
>> Choose an option to login  
Press A if you are an admin.  
Press B if you are a registered student.  
Press C if you would like to register now.  
Press X to exit. X  
  
C:\Users\navee\Desktop\CP Final Project\x64\Debug\CP Final Project.exe (process 20484) exited with code 0.  
Press any key to close this window . . .
```

Conclusion

This program was designed in such a way that future modifications can be done easily. The following conclusions can be deduced from the development of the project:

- Library management system of the entire system improves efficiency.
- It gives accurate access to authorized users depending on their permissions.
- It effectively overcomes the delay in communications.
- Updating of information becomes so easier.
- System security, data security and reliability are the striking features.
- The system has adequate scope for modification in future if it is necessary.

References

To know the key features of a library system

<https://nevonprojects.com/e-library-project/>

<https://rrtutors.com/tutorials/library-management-system-project-in-cplusplus>

To get help for the coding

<https://www.w3schools.com/cpp/>

