BSD 122 – Object-Oriented Programming I

Assignment 1: Online Library Management System (C++)

Introduction

This assignment required me to design and implement an Online Library Management System using Object-Oriented Programming (OOP) concepts in C++. The system allows users to add, remove, search, borrow, and return books.

System Design

The system is made up of three main classes: Book, User, and Library.

OOP Concepts Used

Encapsulation, Abstraction, and Modularity were used to organize and protect data.

Source Code

```
#include <iostream>
#include <vector>
#include <string>
using namespace std;

class Book {
private:
    int bookID;
    string title;
    string author;
    bool isAvailable;

public:
    Book(int id, string t, string a) {
        bookID = id;
        title = t;
        author = a;
        isAvailable = true;
    }

    int getID() { return bookID; }
    string getTitle() { return title; }

    void borrowBook() {
        if (isAvailable) {
            isAvailable = false;
            cout << "Book borrowed successfully.\n";
        } else {
            cout << "Book is not available.\n";
        }
    }

    void returnBook() {
        isAvailable = true;
        cout << "Book returned successfully.\n";
    }

    void display() {
        cout << "ID: " << bookID
             << ", Title: " << title
             << ", Author: " << author
             << ", Status: "
             << (isAvailable ? "Available" : "Borrowed") << endl;
    }
```

```
};

class Library {
private:
    vector<Book> books;

public:
    void addBook(Book b) {
        books.push_back(b);
        cout << "Book added successfully.\n";
    }

    void searchBook(string title) {
        for (auto &b : books) {
            if (b.getTitle() == title) {
                b.display();
                return;
            }
        }
        cout << "Book not found.\n";
    }

    void borrowBook(int id) {
        for (auto &b : books) {
            if (b.getID() == id) {
                b.borrowBook();
                return;
            }
        }
        cout << "Book not found.\n";
    }

    void displayBooks() {
        for (auto &b : books) {
            b.display();
        }
    }
};

int main() {
    Library lib;

    Book b1(1, "C++ Basics", "Bjarne");
    Book b2(2, "Data Structures", "Mark");

    lib.addBook(b1);
    lib.addBook(b2);

    lib.displayBooks();
    lib.borrowBook(1);
    lib.searchBook("C++ Basics");

    return 0;
}
```

Test Cases

Positive test cases include adding books and borrowing available books. Negative test cases include searching for a book that does not exist.

Conclusion

This assignment helped me understand how Object-Oriented Programming works in C++ and how it can be applied to a real-world library system.