This Technical Report outlines the software architecture, design decisions, and verification results for the **Online Library Management System**.

I. System Overview

The Online Library Management System is built in C++ and manages a digital catalogue of books, along with all user borrowing activities. It relies on a flat-file database (library_db.txt) for persistent storage, so all data is retained between sessions.

II. Principles of OOP

1. Encapsulation: The Book class protects data like Title, ISBN, and Availability by keeping these members private. Public getter and setter methods control access, so no one can just change data on a whim.
2. Modularity: The system splits cleanly into three layers:
    a. The Object Layer (Book and User Classes)
    b. The Controller Layer (Library Class)
    c. The Interface Layer (Main Menu).
3. Persistence: Serialization logic keeps everything intact from one session to the next. Data gets stored in a pipe-delimited format (like “a” | “A”) so strings with spaces don’t break the system.

III. System Functionalities

a. User Management: Every new user gets a unique 4-digit UID, automatically assigned.

b. Inventory Control: You can add new titles or remove old ones using their ISBN.

c. Transaction Logic: When a user borrows a book, the system updates its status and connects it to the user’s UID

IV. Verification (Testing Summary)

A comprehensive suite of 10 test cases was executed, covering both **Positive** (Success path) and **Negative** (Error handling) scenarios. The full testing log is attached in the accompanying .xlsx file.

V. INSTRUCTIONS FOR USE

a. Ensure main.cpp and library_db.txt are in the same directory.
b. Run the main .exe file to execute the program