C++ Mini Project- Library Fine Calculator

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1. INTRODUCTION

The Library Fine Calculator is an automated tool designed to address the challenges faced by libraries in India, such as manual calculation errors and administrative overhead during peak hours. By utilizing an Object-Oriented Programming (OOP) approach, this system provides a transparent and efficient way to manage overdue book returns and ensure students receive accurate, instant fine calculations.

2. PROBLEM STATEMENT

Manual fine management is often time-consuming and prone to human error. Librarians frequently struggle with:

• Maintaining accurate records for multiple books simultaneously.
• Applying complex fine structures consistently.
• Resolving disputes with students over calculated amounts.

3. OBJECTIVES

The primary goals of this project are:

• Accept Book Details: Provide a user-friendly interface to capture titles and overdue duration.

• Automated Calculation: Apply conditional logic to determine fines based on predefined rules.

• Generate Receipts: Produce professional, formatted documentation for every transaction.

4. TECHNICAL ARCHITECTURE

The application is built using C++ and follows a modular class-based design.

Core Concepts Used

• Classes & Objects: Used as a blueprint to model the library's real-world entities.

• Encapsulation: Protects data by keeping members like *totalFine* private and accessible only through controlled methods.

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• Conditional Logic: Implements the tiered fine structure through nested if-else statements.

Class Structure: LibraryFineCalculator

Data Members

• memberName
• bookTitle
• daysOverdue
• totalFine

Member Functions

• inputDetails(): Collects user data via console.
• calculateFine(): Computes the penalty based on duration.
• displayReceipt(): Outputs the final transaction details.

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5. FINE STRUCTURE & LOGIC

Overdue duration	Fine rate (Rupees)
0 days	No fine
1-5 days	₹5 per day
6-10 days	₹10 per day
Above 10 days	₹20 per day

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6. IMPLEMENTATION FLOW

The program execution follows a linear, three-phase flow:

1. Input Phase

Prompts for the member's name, book title, and overdue days.

2. Logic Phase

Uses the rates above to determine the amount
(e.g., 8 days results in a ₹80 fine).

3. Output Phase

Displays a formatted Fine Receipt with all details for transparency.

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7. CONCLUSION AND FUTURE SCOPE

The Library Fine Calculator project successfully demonstrates how Object-Oriented Programming can be applied to solve real-world administrative challenges. By automating a previously manual process, the system ensures higher accuracy, saves significant time during peak hours, and provides a transparent record that builds trust between the library staff and students.

Beyond its immediate utility, the program serves as a robust educational resource for understanding core C++ principles like encapsulation and modular design.

FUTURE SCOPE

To further enhance the system and move toward a comprehensive library management solution, the following features are planned:

• Database Integration: Connecting the application to MySQL or PostgreSQL to maintain permanent historical records for data analysis and reporting.

• Student Account System: Implementing a login portal where students can view their borrowing history linked to their unique identification numbers.

• Multi-Book Support: Extending the class logic to handle multiple book returns in a single transaction using arrays or vectors.

• Web/GUI Development: Transitioning from a command-line interface to a web-based application to allow access from any device across the university campus.

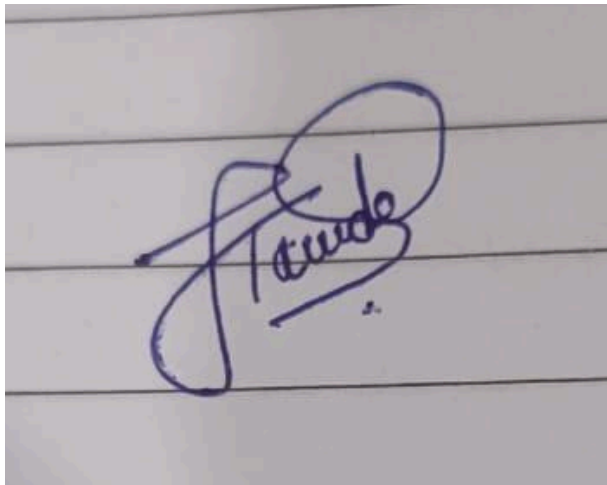# C++ Mini Project- Library Fine Calculator

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4. DECLARATION

I hereby declare that this project entitled **"Library Fine Calculator using C++ concepts"** is an original work carried out by me and my group for academic purposes.

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Date: 23rd February 2026