

VITYARTHI COURSE PROJECT

PROJECT TITLE: Library Management System

COURSE TITLE: Introduction to Problem-Solving Skills & Programming

COURSE CODE: CSE1021

FACULTY: Sivabalan KR

COURSE SLOT: B14 + B23 + D21

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REGISTRATION NUMBER: 25BAI10145

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INTRODUCTION

- Library Management System is an application that is used to manage the resources efficiently by libraries
- It is used to manage various jobs like the addition of books, the removal of books, showcasing all the books, borrowing books & returning of books
- This application will help us track how many books are available in the library & how many books were issued to the students
- It maintains the records online, which helps to store data & access it when necessary
- It provides users with easy access to library resources through the online directory
- It reduces the workload of management, as most of the manual work is reduced

PROBLEM STATEMENT

- The purpose of the Library Management system is to allow for storing details of a large number of books & allow for adding, searching, borrowing, and returning facilities
- The problem occurred before having a digital library system, includes:
 - Loss of records - Due to human error, it is possible to lose the records of the files or also due to natural disasters
 - Space-consuming - The space for physical storage of records is limited & making it hard to fetch the required record

- Cost-consuming - As physical documentation of maintaining library records requires paperwork

OBJECTIVES

- The main objective of the Library Management System is to organise & manage the library tasks
- Users can search for books & renewal of books online
- Applying the concepts from the core course, such as pandas, dataframes, functions, loops & datatypes to create the application
- Testing & validating the application with sample inputs for smooth running

SCOPE OF PROJECT

- The document only covers the required specifications of the Library Management System
- This project is basically updating the manual library system into a software-based application so that the user can check the availability of books
- After digitalising, the system is implemented, and less human effort will be required to maintain the library, thus reducing the overall cost
- To utilise resources effectively by increasing their productivity

FUNCTIONAL REQUIREMENTS

- Admin Module:
 - Add Books -
 - Admin can add books to the system by entering the title of the book & the author's name
 - Removal of Books -
 - Admin can remove books from the system by entering the title of the book & the author's name
- Student Module:
 - Student's login -
 - Students have to use their user ID and password to login
 - Show Books option -
 - Students can access this option to view the list of all books present in the library
 - Borrow a book -
 - Students can borrow a book on a particular day & mention their returning date using this option
 - Return a book -
 - Students can return the book that they have borrowed from the library
- Data input:
 - The system allows the user to choose their option, whether they want to add a book, remove a book, borrow a book, return a book or exit

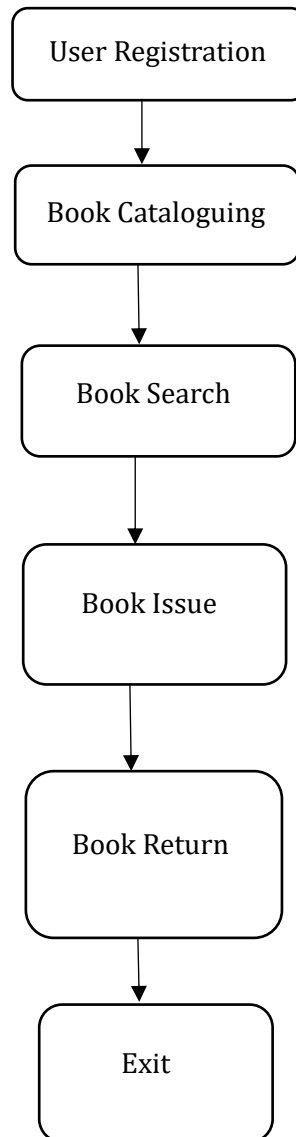
NON-FUNCTIONAL REQUIREMENTS

- Usability Requirements:
 - The user interface is interactive, simple & easy to understand
 - The system handles all the expected & non-expected errors in ways that prevent loss of information
- Security Requirements:
 - The system uses a secure database
 - Not all users can edit or modify anything except their personal information
 - Proper user authentication is provided
 - No one can hack the user's password
- Performance Requirements:
 - The system accommodates a large number of books & users without any errors
 - It flashes the information when accessed within or no longer than 5 seconds
- Software Quality Attributes:
 - The quality of the system is maintained in such a way that it can be very user-friendly to all users of the system
- Hardware Constraints:
 - The system has backup capabilities
 - The system requires a database for storing the persistent data

SYSTEM ARCHITECTURE

- The system architecture for this system defines the structural design of its components & how it interacts to provide functionalities
- The system is designed as a 3-tier architecture consisting of:
 - Presentation layer -
 - The user interface accessed by the librarian & the user for interacting with the system
 - Application layer -
 - It includes all the core operations like borrowing, returning, addition, and removal
 - Data layer -
 - The system stores all persistent data, including books & profiles

WORKFLOW DIAGRAM



DESIGN DECISIONS & RATIONALE

- Architecture: 3-tier layered design
 - Decision - Adopting 3-tier architecture (Presentation/Application/Data)
 - Rationale - Separating concerns enabling modular development & easier maintenance

- Database design with normalization:
 - Decision - Using a relational database with normalized tables for books
 - Rationale - Normalization reduces data redundancy & ensures data consistency & integrity
- Unique identification using barcodes:
 - Decision - assigning unique barcodes to books & users
 - Rationale - Barcodes enhance speed & accuracy in transactions
- Access control & role management:
 - Decision - Defines roles with specific permissions
 - Rationale - Protects system security by restricting sensitive operations

IMPLEMENTATION DETAILS

- The system can keep track of the members joining & leaving the library, borrowing & returning of the books
- Checking the availability of the books using different attributes as parameters
- Frontend: Uses HTML, CSS, JavaScript to interact with the system via web browsers
- Backend: Using languages like PHP, Python, Java or JavaScript
- Database: Relational databases like MySQL are used to store structural data about books for efficiency & integrity

TESTING APPROACH

- Unit testing:

- Each individual form of the program was tested to ensure that each performs the function for it was designed
- This testing involves the testing of the interface to ensure that the information flows into & out of the program unit under task
- The testing involves the data validation for each form & the complete functionality of the form itself
- Integration testing:
 - The integration testing was performed on the unit test modules
 - These modules were combined into subsystems, which were then tested
 - The goal was to check whether the integration of the modules was poor & to detect design errors by focusing on testing the interconnection between modules
- System testing:
 - The entire software system was tested
 - The goal was to see if the software met its requirements
 - The functionality along with the security, recovery etc. features of the system is also tested
 - System tests are designed to validate a fully developed system with a view of assuming that it meets its requirements
- User acceptance testing:
 - The users of the system with the inputs of realistic data performed this testing
 - The testing is done in controlled environment with logging of all errors

- Based on the errors found in the system, the users accepted the system with few modifications to the system, in order to rectify the errors

SCREENSHOTS/RESULTS

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

* NEW USER CREATE AN ACCOUNT *

Enter the name of the user: NIVETAA T

Enter the user ID: 25BAI10145

Name	User_ID
NIVETAA T	25BAI10145

| ACCOUNT CREATED SUCCESSFULLY ||

book_id	book_name	author_name	Status
101	CALCULAS	B.S. GREWEL	Available
102	COMP_CHEMISTRY	ALEXANDAR	Available
103	EEE	BATTACHARYA	Available
104	EFFECTIVE COMMUNICATION	G.V.PRAKASH	Available
105	THE_DOWNTOWN_CITY	GERONIMO	Available
106	THE GREAT BRITAN	RAMCHARAN	Available
107	THE LION KING	HIT MAN	Available
108	THE TALE OF GALLEY	VK DAS	Available

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 1

=== Add New Book ===

Enter The Book Name: THE TIGER KING

Enter The Author Name: NS CHAITANYA

Successfully added

book_id	book_name	author_name	Status
101	CALCULAS	B.S. GREWEL	Available
102	COMP_CHEMISTRY	ALEXANDAR	Available
103	EEE	BATTACHARYA	Available
104	EFFECTIVE COMMUNICATION	G.V.PRAKASH	Available
105	THE_DOWNTOWN_CITY	GERONIMO	Available
106	THE GREAT BRITAN	RAMCHARAN	Available
107	THE LION KING	HIT MAN	Available
108	THE TALE OF GALLET	VK DAS	Available
109	THE TIGER KING	NS CHAITANYA	Available

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 2

=== Displaying Available Books ===

The Books Present In Library:

book_id	book_name	author_name	Status
101	CALCULAS	B.S. GREWEL	Available
102	COMP_CHEMISTRY	ALEXANDAR	Available
103	EEE	BATTACHARYA	Available
104	EFFECTIVE COMMUNICATION	G.V.PRAKASH	Available
105	THE_DOWNTOWN_CITY	GERONIMO	Available
106	THE GREAT BRITAN	RAMCHARAN	Available
107	THE LION KING	HIT MAN	Available
108	THE TALE OF GALLET	VK DAS	Available
109	THE TIGER KING	NS CHAITANYA	Available

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 3

Enter the Book Name to delete: THE TIGER KING

Updated DataFrame:

book_id	book_name	author_name	Status
101	CALCULAS	B.S. GREWEL	Available
102	COMP_CHEMISTRY	ALEXANDAR	Available
103	EEE	BATTACHARYA	Available
104	EFFECTIVE COMMUNICATION	G.V.PRAKASH	Available
105	THE_DOWNTOWN_CITY	GERONIMO	Available
106	THE GREAT BRITAN	RAMCHARAN	Available
107	THE LION KING	HIT MAN	Available
108	THE TALE OF GALLET	VK DAS	Available

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 4

=== Borrow A New Book ===

Enter The Book Name: EEE

Book Found! Please provide details.

Enter The Book Borrowing Date (YYYY-MM-DD): 2025-10-26

Enter The Book Due Date (YYYY-MM-DD): 2025-11-11

YOU BORROWED A BOOK , THANK YOU

--- UPDATED LIBRARY BOOKS ---

book_id	book_name	author_name	Status	Borrow_Time	Due_Time
103	EEE BATTACHARYA	Borrowed	2025-10-26	2025-11-11	

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 5

===== To Return The Borrowed Book =====

Enter The Book Name to return: EEE

Book EEE has been returned successfully!

--- UPDATED LIBRARY BOOKS ---

book_id	book_name	author_name	Status	Borrow_Time	Due_Time
101	CALCULAS	B.S. GREWEL	Available	NaN	NaN
102	COMP_CHEMISTRY	ALEXANDAR	Available	NaN	NaN
103	EEE	BATTACHARYA	Available	2025-10-26	2025-11-11
104	EFFECTIVE COMMUNICATION	G.V.PRAKASH	Available	NaN	NaN
105	THE_DOWNTOWN_CITY	GERONIMO	Available	NaN	NaN
106	THE GREAT BRITAN	RAMCHARAN	Available	NaN	NaN
107	THE LION KING	HIT MAN	Available	NaN	NaN
108	THE TALE OF GALLEY	VK DAS	Available	NaN	NaN

=====WELCOME TO VIT-BHOPAL- LIBRARY MANAGEMENT=====

- 1) ADD BOOK
- 2) SHOW ALL BOOK
- 3) REMOVE BOOK
- 4) BORROW A BOOK
- 5) RETURN A BOOK
- 6) Exit

Enter Your Choice: 6

Thank you for using the Library Management System!

CHALLENGES FACED

- User interface:
 - Designing a simple interface where all non-technical users can handle was indeed a challenge

- Providing automatic navigation for searching, issuing, returning books
- Technical Implementation:
- Choosing the right technology stack was hard and time consuming
- Dealing with network issues
- Initial data entry was incorrect which did make my process longer

KEY TAKEAWAYS

- It improved my understanding of the database design
- It provides the hands-on experience with creating, reading, updating & deleting operations for managing records
- It made me understand how libraries function
- It provides better knowledge of the system workflow
- It provides an exposure to the real-world constraints

FUTURE ENHANCEMENTS

- There is a future scope of this facility that many more features like tutorials can be added
- A feature of group chat where students can discuss about their issues, concerns & doubts and clarify immediately
- This makes it more interactive & more user friendly

REFERENCES

- Python Essentials course from the VITYARTHI portal
- Core concepts from the course "Introduction to Problem Solving Skills & Programming"
- Google for learning regarding documentation
- Feedbacks from:
 - Faculty: Sivabalan K R