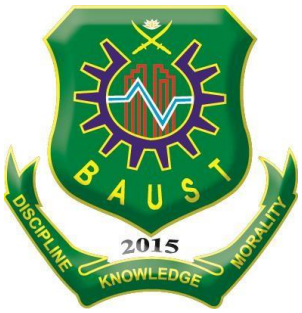
Bangladesh Army University of Science and Technology (BAUST), Saidpur



Lab Report

Department: Computer Science & Engineering

Course Title: Database Management Systems Sessional

Course No: CSE 2206

Project Title: BAUST Library Management System

Submitted by:

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BAUST Library Management System

Introduction:

A library serves as center for knowledge, education and cultural enrichment. It has vast collection of books on various topic, reference materials and academic publication. And if this library can be made online based then the library resources, library management operations become quite easy to handle and also enhance the use experience. Thinking about these advantages, our university's library has started to make library management system online based. Our project aims to add more functionalities to our library management system according to the demands and ensuring accessibility for all the users in the university which includes, students, teachers, staffs etc.

Problem Definition:

In our BAUST library, we have manual library management process. Students face challenges in accessing and borrowing materials due to limited resources and information availability. Even the staffs find it difficult to keep track of fine dues of borrowers which leads to resource limitations. Also manual record-keeping hinders data accuracy and the absence of reporting tools makes it challenging to track library usage and optimize resources.

Available applications:

For better idea on library management system, we studied about different other library's management system such as:

Atriuum[a]: It is a propriety system which is efficient in cataloging and book management, book circulations and checkouts and has data security and privacy. But despite these, Atriuum has less modern user interface and inflexible to library needs also not available free.

Destiny Library Manager[b**]:** it is also propriety system having digital resources management and resource reservation system. It is limited only for non-English speakers and also unavailable free.

BAUST Central Library[c]: Our university's library has integration with educational platforms and they are planning to keep system od scanning book with QR code. But here only students can register and can access within the campus area.

Koha[d]: it is an open-source management system having integration and user management capabilities. But is has customizing complexity and performance issue.

Alma[e]: it is also a propriety system offering user experience customization and analytics, reporting feature. But it is expensive for smaller libraries.

Stakeholders:

Library patrons: The main users of our system are students and teachers of our university, whom we are referring to users.

Library Staff: Librarians are the personnel who maintain circulation, attends desk, arrange catalogs assist patrons and performs administrative tasks.

Library administrators: They oversee the library operations and make decision about the system's implementation and budget.

Library IT department: They are responsible for managing and maintaining thee library's software and network infrastructure.

Library Advisory Boards: These are the people who provide input and guidance on library services and technology.

Issue Encountered:

As php and MySQL both were two different new language, we studied about them and acquired knowledge so that the connection with the database becomes easy to handle.

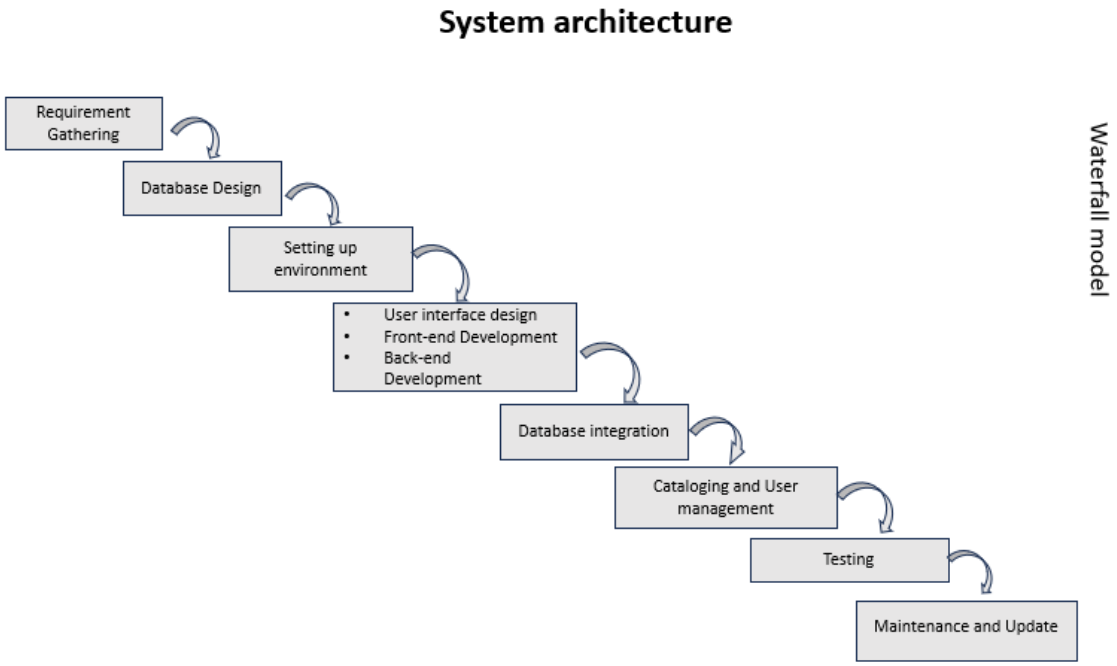
While creating our project, we faced some challenges related to data integrity. There is a high chance of data corruption, inconsistency. Also we worked on validation of the patrons so that other than our university students, no one can intervene in our system.

Security related issues where encountered which involve patron's information securing and unauthorized access.

Data retrieval in our system can be quite complex dealing with large set of data and catalog and book circulation, customization become dependent on any kind of update in the system.

We tried to follow necessary tutorials and saw related projects creation and tried to implement according to it. And we faced several errors while linking up one module with another, so to took help from ***ChatGPT*** to solve those problems. We learned about MySQL from website named: ***mysqltutorial.org.***

System Architecture:



- **Requirement Gathering:**

Requirement gathering for a library management system is a critical phase in the system development process. It involves understanding the needs and expectations of the library staff, administrators, and end-users to define the system's functional and non-functional requirements

- **Database Design:**

The database design of a library management system is a critical aspect of the system's architecture. It involves creating a structured database that efficiently stores, manages, and retrieves information related to library resources, users, transactions, and more. Here is a description of the key components and tables in the database design for a library management system:

1.User Table:

Table Name: users

Description: This table stores information about library users, including students, faculty, and staff.

Fields:

ID (Primary Key)

User Type (Student, teacher)

Name

Email Address

Contact Number

Address

2.Book Table:

Table Name: books

Description: This table contains information about library resources, including books, magazines, and multimedia materials.

Fields:

Book ID (Primary Key)

Author

ISBN (International Standard Book Number)

Category

3.Categories table:

Description:

This table stores book categories or genres, such as Fiction, Non-Fiction, Science, History, etc.

Fields:

Category ID (Primary Key)

Category Name

Author Table:

4.Authors table:

Description: This table contains information about book authors.

Fields:

Author ID (Primary Key)

Author Name

- **Setting up environment:**
  Setting up the development environment for a library management project involves configuring the necessary software, tools, and resources to build and test the system.
- User interface design

- Front-end Development
- Back-end Development

- **Testing:**

Testing a library management system is a crucial step to ensure that the software functions correctly, meets user requirements, and is free from defects. The testing process should cover various aspects of the system, including functionality, performance, security, and usability.

- **Database integration:**

Database integration in a library management project refers to the process of connecting and synchronizing the project's application with a database system. This integration is crucial for efficiently managing library resources, user information, transactions, and more.

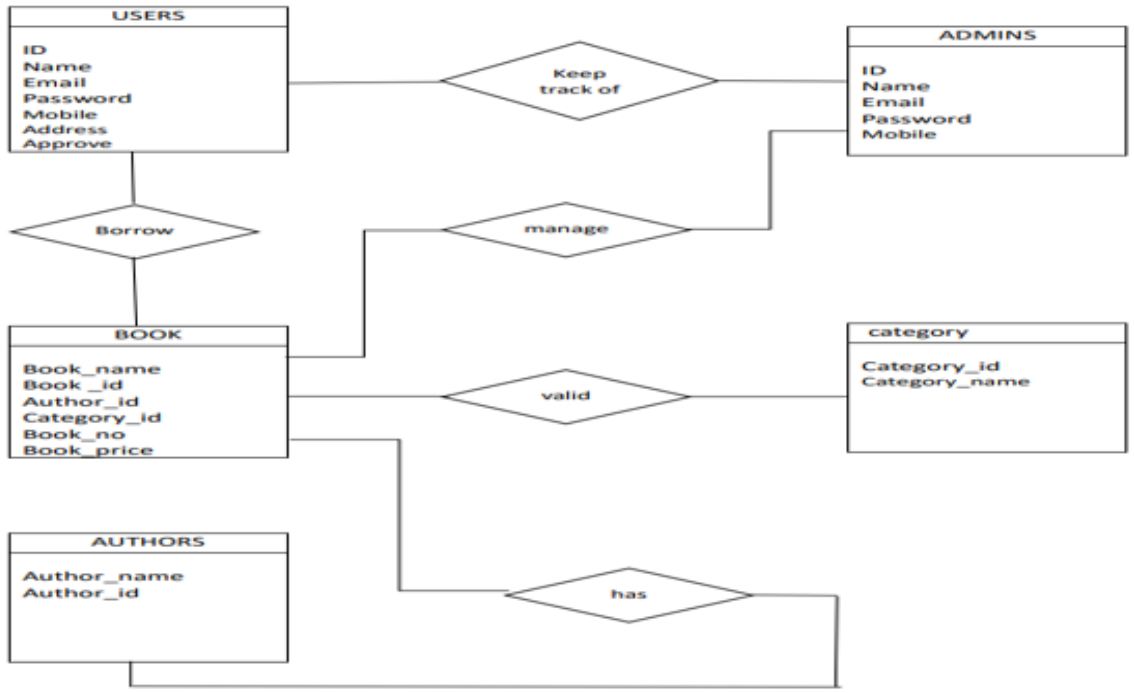
- **Cataloging and User management:**

Cataloging and user management are essential components of a library management system (LMS) that facilitate the organization of library resources and the administration of user accounts.

- **Maintenance and Update:**

Maintaining and updating a library management project is essential to ensure that the system continues to function effectively, meets user needs, and remains secure and up-to-date.

Database Design:



Admin keeps track of users with their given information.

Users can borrow book with required book name, book number author etc. and those books are managed by admin. Whether the book is valid to include in category or not decides the category table. The authors can register their book using author_id, author_name and the registered book will be included in the Book table and again users can see and choose authors books.

Tools and Technology:

Php: It is a widely used server-aid scripting language for web development. We used it so that php scripts can be executed on the web server, generate dynamic content which is sent to the client's web browser.

MySQL: For database management, we used MySQL that allows storing data in tables with rows and columns, retrieval operations and it management, data manipulation, data integrity, security, data recovery etc.

HTML: We have done creating forms, such as text fields, radio buttons, checkboxes, and buttons and using the <a> element we have done link to other web pages, files, or resources both internally and externally.

CSS: We have done colour, font size, margin, padding, background colour, and many more using CSS.

JavaScript: It is a widely used server-aid scripting language for web development. It runs in the user's web browser, allowing to create dynamic and interactive web pages without the need for server-side processing.

Bootstrap: We used bootstrap for front-end framework. It is used to simplify the process of creating responsive, mobile-first websites and web applications.

Implementation:

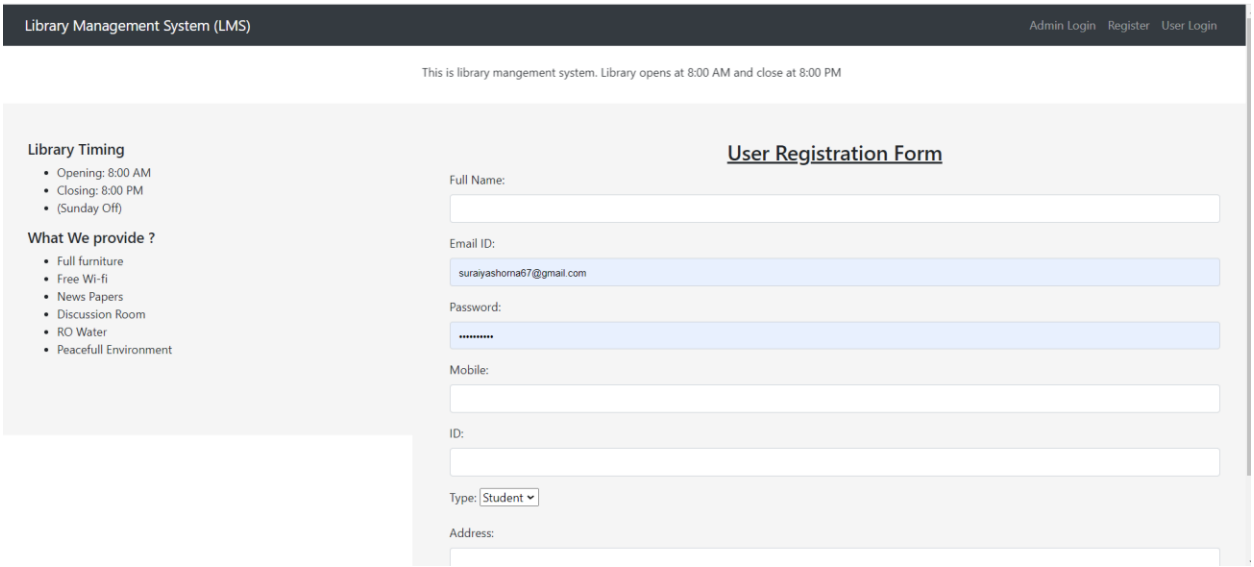


Fig:1 (User Registration)

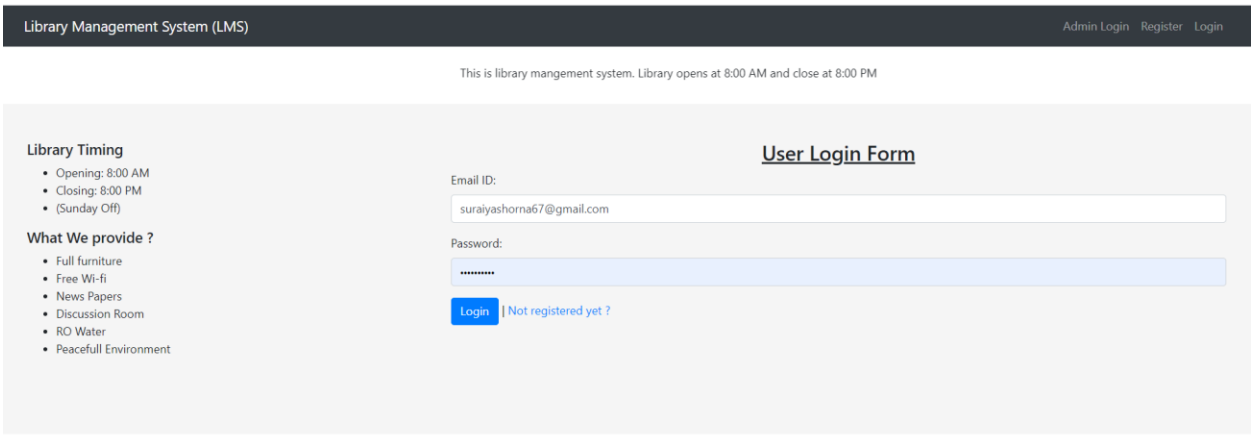


Fig:2(User Login)

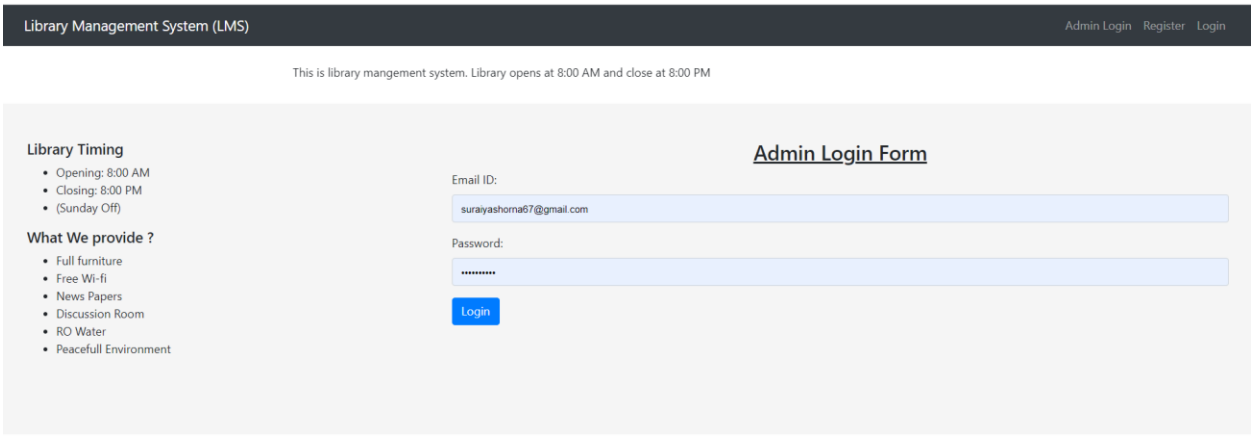


Fig:3 (Admin Login)

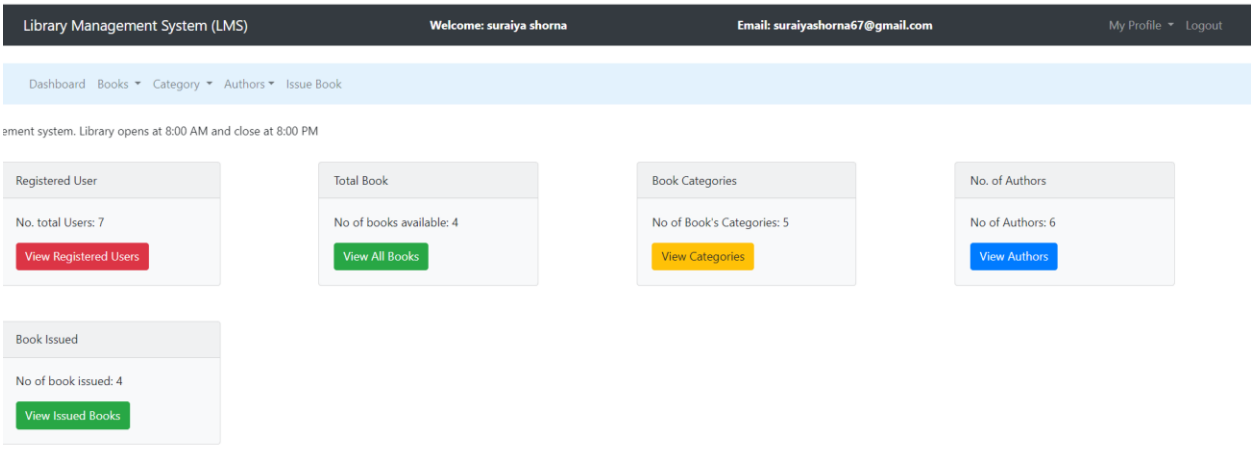


Fig:4(Admin Dashboard)

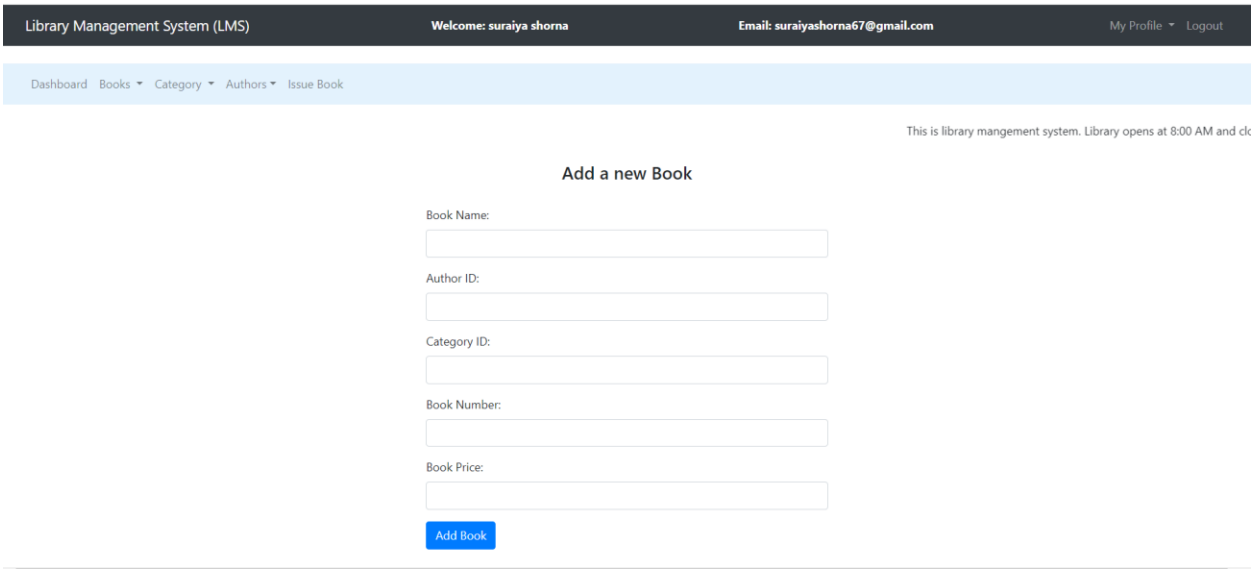


Fig:5(Adding book)

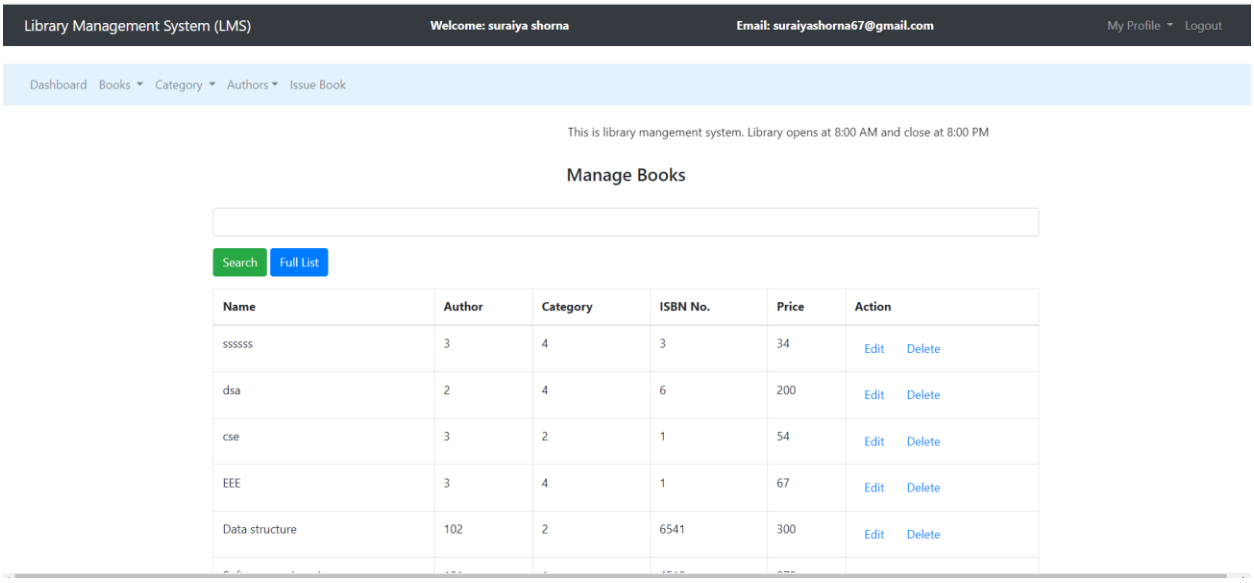


Fig:6(Managing book)

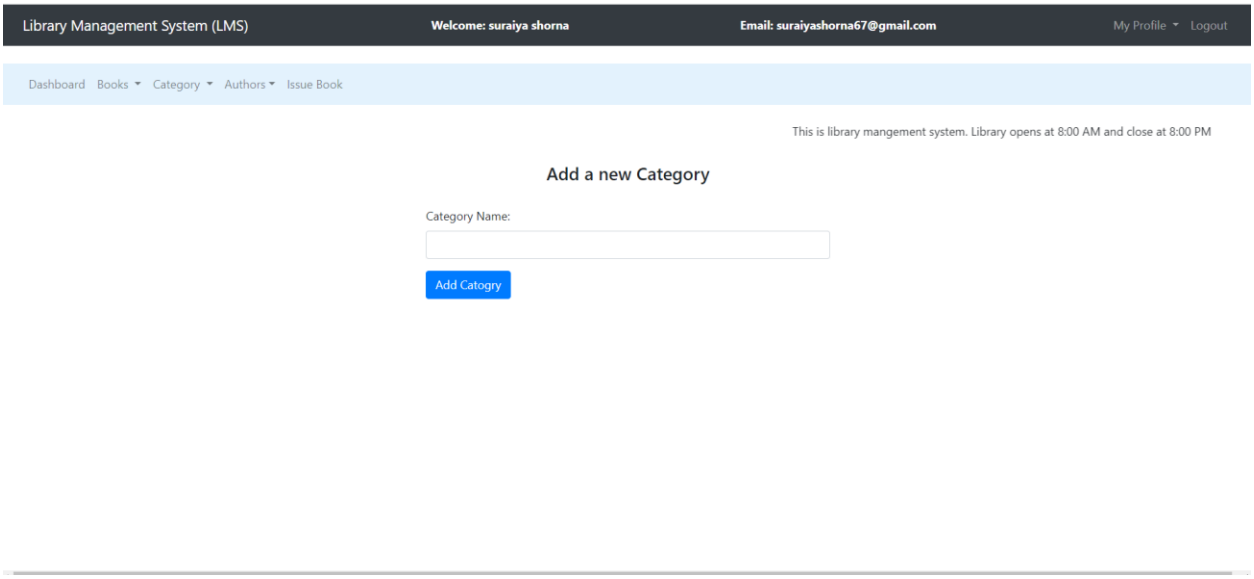


Fig:7(Adding Category)

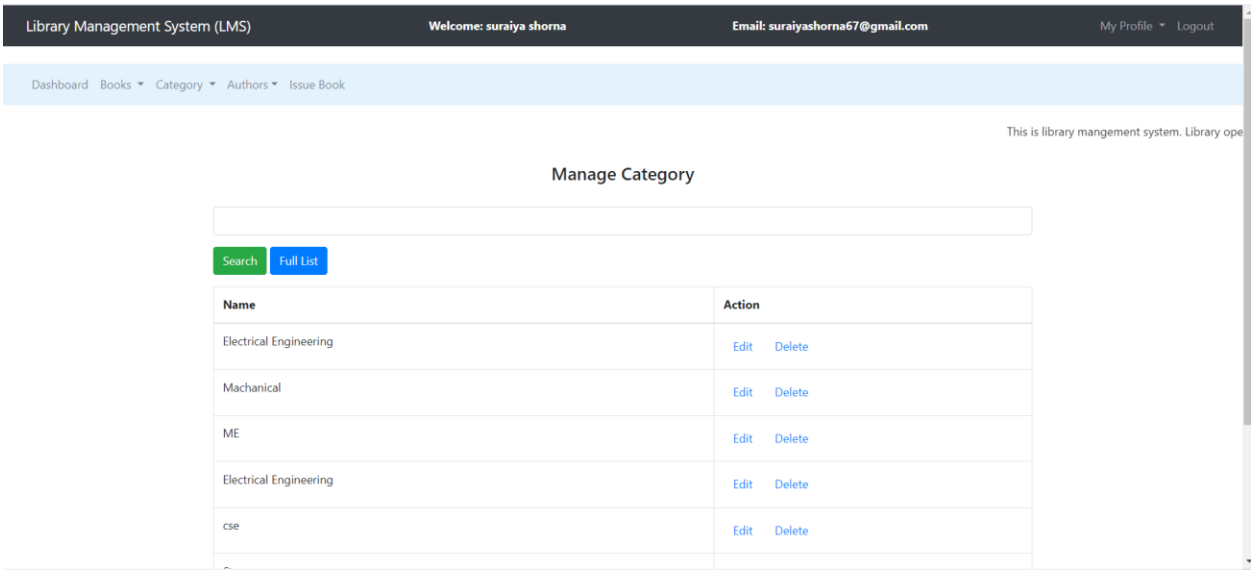


Fig:8(Managing Category)

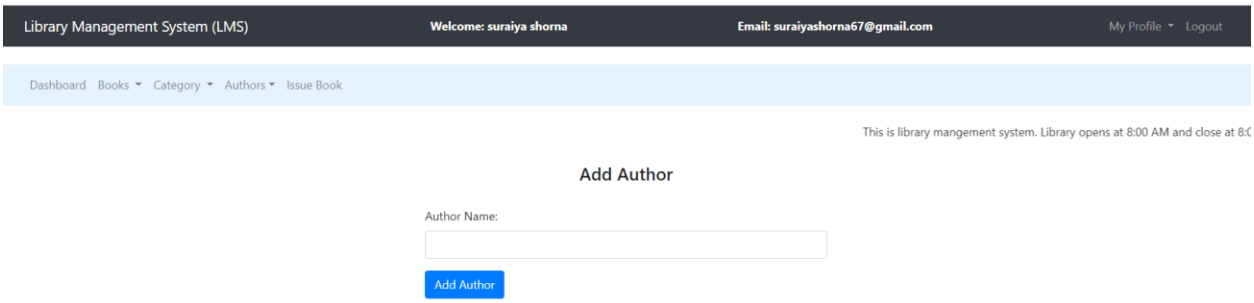


Fig:9(Adding author)

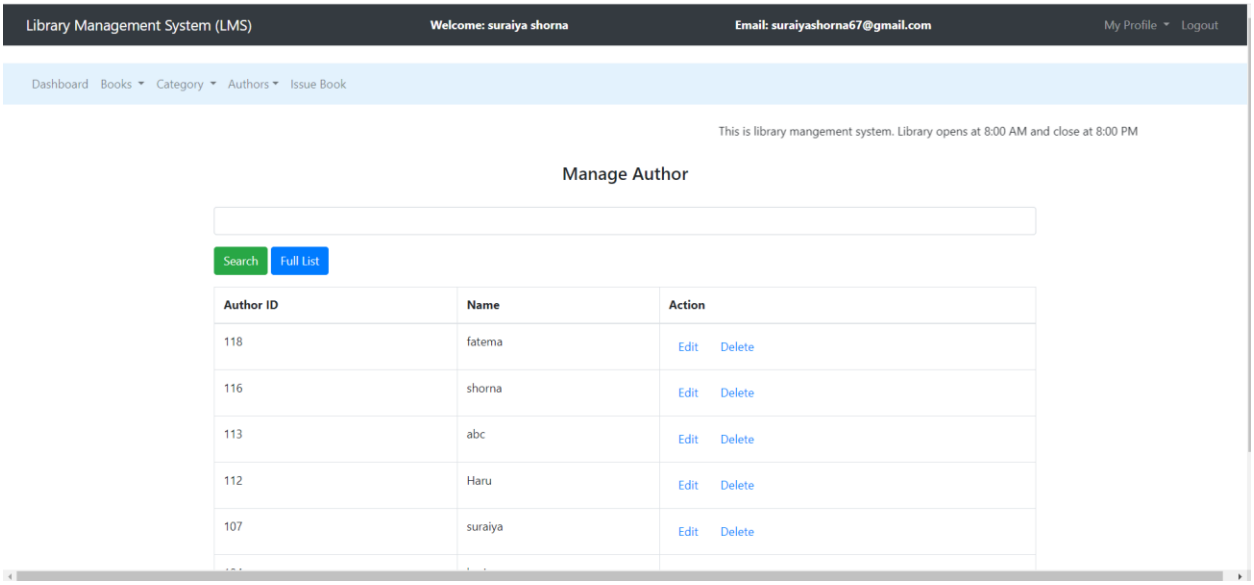


Fig:10(Managing author)

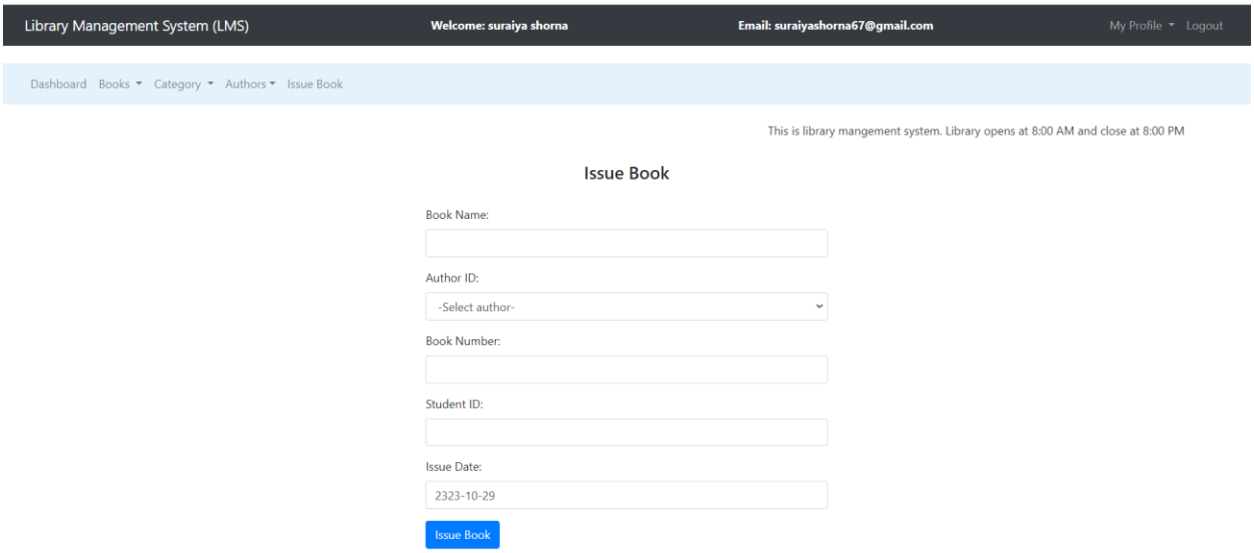


Fig:11(Issuing book)

Limitations:

In our system, we have included approval system for that not everyone can enter our system where when a user is registering, admin will get a notification whether to approve the user or not. If admin approves, then only user will get registered in our system and can login. But in case of emergency, the user have to wait long for admins approval. Our system has limitation with notifying users about their penalty fees. The need to login to his/her account to check notifications which is not always convenient. For huge number of data set, our system might face difficulty with data integrity and can become quite complex. Managing this complexity can be our system's limitation.

Conclusion:

As we started as beginners, we faced challenges in creating our system and tried to came up with different solution. But tried including the necessary requirement users of our university and put them altogether in our project. So, our library management system can be very effective for efficiency of library's manual work like organizing and managing library resources. Our system can ensure smooth library operations. There were existing many library systems and we took idea from their functions and tried to implement in our project. This system can be unique for our university's library in various ways.

References:

- Atriuum book system: https://booksys.com/atriuum [a]
- Destiny Library Manager: https://www.follettlearning.com/education-technology/library-management-system [b]
- BAUST Central Library: http://library.baust.edu.bd/ [c]
- Koha: https://koha-community.org/ [d]
- Alma: https://exlibrisgroup.com/products/alma-library-services-platform/ [e]
- PHP: https://www.php.net/docs.php [f]
- Sublime Text: https://www.sublimetext.com/docs/ [g]
- MySQL: https://dev.mysql.com/doc/ [h]

Complex Engineering Problems (CP) and Complex Engineering Activities (CA) Analysis

Attainment of Complex Engineering Problem (CP)

S.L.	CP No.	Attainment	Remarks
1.	P1: Depth of Knowledge Required	Yes	K3 (Engineering Fundamentals): Requiring knowledge of basic database management. (Sec. 7).
			K4 (Engineering Specialization): Requiring Knowledge of php and MySQL (Sec. 8).
			K5 (Design): Flow Chart of Methodology using waterfall model shows solution design of the problem (Sec. 6).
			K6 (Technology): XAMPP server, PHP, MySQL, Bootstrap, JavaScript etc. (Sec. 8).
			K8 (Research): Studied about related application to find limitation (Sec. 3).
2.	P2: Range of Conflicting Requirements	Yes	Library Management- Sec. 1), Web technologies (PHP, MySQL, Bootstrap, etc Sec. 8), Database Management System (Sec. 7).
3.	P3: Depth of Analysis Required	Yes	How library management system works and what are the users demand (Sec. 6)
4.	P4: Familiarity of Issues	Yes	As CSE student and beginner of new languages, facing errors and using resources to solve problems. (Sec. 5).
5.	P5: Extent of Applicable Codes	Yes	Using Waterfall Software Development Model (Sec. 6).
6.	P6: Extent of Stakeholder Involvement and Conflicting Requirements	Yes	Includes students, teachers, librarians also advisory boards of university (Sec. 4)
7.	P7: Interdependence	Yes	Involves login system, managing book circulation, resource management etc. (Sec. 9).

Mapping of Complex Engineering Activities (CA)

S.L.	CA No.	Attainment	Remarks
1.	A1: Range of resources	Yes	Involves students, teachers, librarians Computer Engineers, Technologies: PHP, MySQL, Bootstrap, JavaScript etc. (Sec. 4 and Sec. 8).
2.	A2: Level of interaction	Yes	While solving encountered issues, having conflicts with database and php connections (Sec. 5).
3.	A3: Innovation	No	
4.	A4: Consequences for Society and the Environment	Yes	Provides facilities to all the users of the university and making easy for librarians to handle library operations. (Sec. 10).
5.	A5: Familiarity	No	