Team Project:
Deliverable 2 – Requirements Specifications
CSCE 5430 (Spring 2023)

Project Title:
Online Library Management System

Group Name:
Penguins

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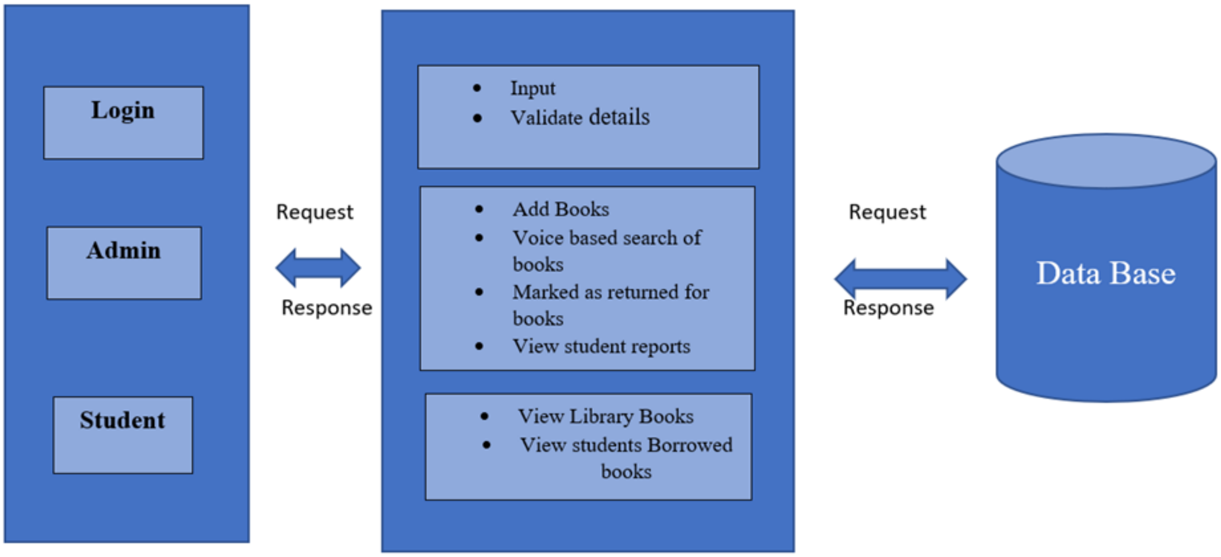
A. Structure of the system

Software architecture is a visual representation of how requests move from users to databases via servers. It involves a collection of techniques for conveying, sharing, and assessing software architecture (also known as architecture visualization), as well as the output of implementing such techniques through a deliverable that depicts a software architecture.



The Library Management System is voice based and it can search books online and help the students in issuing books in a hassle-free manner. Based on the book's title, authors, and information gathered online, the Library Management System can identify and retrieve the book. The overall structure of the project is divided into 3 sub-components.

- Login
- Admin
- Student

Each component has its own unique features and capabilities which increases the dependency on them. Clubbing one component with another can cause severe irregularities and the outcome might not be as expected.

Login –

This is one of the most important and the basic step of the Library Management System. The two major features of Login screen are to

- Admin view/login
- Student view/login

There will be two sign up options which are admin and student view. When the admin or student has to login, they will have to input the username and password. Once the admin or student input the login credentials, the credentials will be validated and then if they are correct they will be logged into the Library Management System.

Admin –

This is another important subsystem of the Library Management System. If the admin is registering for the first time into the portal, he/she must sign up using details like FirstName, LastName, Username and Password. If the admin is already registered, he/she can directly login to the Library Management System admin portal. Here the credentials of the admin i.e, username and password are authenticated. One of the key features of the admin is that he can add books. The book can be added into the portal by filling out multiple details like book name, book author, ISBN number of the book & number of copies available in the library. Other features of the admin include viewing registered students, viewing available books and the number of copies available in the library, issuing books to the students by filling the details of book like book name, ISBN number and the student details like student name, enrollment and view issued books.

Student –

This is the other important subsystem of the Library Management System. If the student is registering for the first time into the portal, he/she must sign up using details like FirstName, LastName, Username, Password, Email Address, Enrolment and Branch. If the student is already registered, he/she can directly login to the Library Management System student portal. Here the credentials of the student i.e, username and password are authenticated. Features of the student include checking for the available books in the library and also can view their own books, which are issued to them by admin. The other potential features could be returning the books issued and paying the fine if any imposed.

B. Software Requirements Specifications

Table of Contents

1.Introduction:

1.1 Purpose:

The motive for the development of this project is to introduce voice based search to the library systems at the universities with automatic categorization of books based on the title. This system decreases the access time required for the manual search with Voice search and enables the management to keep track of the books and increases the productivity by automating the fine generation for the overdue books. The main goal of the project is to add and improve the quality of life features for the Library management system for ease of use.

1.2 Intended Audience and Reading Suggestions:

This document is intended for various individuals, including potential developers, evaluators, testers, and end-users who are interested in the project. It is recommended that readers start with the overview and then navigate to the sections that are most relevant to their particular role or interest.

1.3 Project Scope:

The scope of this project includes the development of an online library management system that caters to distinct product users based on their roles and permissions. The system will have separate interfaces for admin and students, with the authentication of users required at login. The staff interface will allow for the addition or issuance of books and the viewing of registered students. Students will have access to a status page where they can view the books borrowed by them.

One of the key features of the system will be the facility for voice-based book search, which will enhance the user experience. Additionally, the system will automatically categorize books into different genres based on the title.

Overall, the project will aim to provide an efficient and user-friendly platform for managing library resources, with features that cater to the needs of both staff and students.

1.4 References:

Documentation Format:

https://unt.instructure.com/courses/71170/files/17537570?module_item_id=4385242

Interface Requirements Guide:

External Interface Requirements in SRS | T4Tutorials.com

2. Overall Description:

2.1 Product Perspective:

Our Project started with the concept of using voice based search to improve the quality of life for the students who use the portal to browse for the book of interest . This system will provide an efficient way for staff to add or issue books and manage registered students, with automated categorization of books into different genres based on the title. The facility for voice-based book search will enhance the user experience and make the system more accessible for visually impaired or physically disabled students.

2.2 Product Features:

The Online Library Management system will enhance the overall user experience and improve productivity and efficiency in library management. The features for the system are described below:

2.2.1 User Registration :

The "New User Registration" feature allows all users to create an account, while the system should be capable of verifying the provided information and ensuring that all necessary information has been entered by the user.

2.2.2 User Login:

The "User Login" feature enables the user to access the system by providing their user ID and password, which are validated by the system. If the credentials are incorrect, access to the system is denied. The user ID is generated during the registration process.

2.2.3 Book Search:

The "Book Search" feature is accessible to both the Admin and Student users. This feature enables users to search for books in the system by book ID, book name, category, or author name.

2.2.4 Automatic Categorization:

When an Admin adds a book to the system, the "Automatic Categorization" feature is performed by the system, which categorizes the book based on its genre.

2.2.5 Register New Book:

The "Register New Book" feature permits the Admin to add new books to the library.

2.2.6 Issue and Return Books:

The "Issue and Return Books" feature enables the Admin to issue and return books, as well as view reports of books that have been issued.

2.2.7 View Books Issued to the User:

The "View Books Issued to the User" feature permits students to see the books that have been issued to them.

2.3 User Classes and Characteristics

Users who are using the Library Management System are classified into admins & students. Both have different use cases.

2.3.1 Admin

- When a user is logged as an admin, he/she will have access to the entire Library Management System by which they can control, view, access and read the data.
- He or she can add multiple books into the system, which means they can feed the data. Each book is identified uniquely by the ISBN number.
- The admin can even add the number of copies of the same book available.
- The admin can even view the books borrowed by the students for clear tracking of books.

2.3.2 Student

- Student can borrow multiple books from the Library Management System
- He can sign up by giving the student ID which is unique for every student in the campus
- Once the user is logged in, he can see the books that are available for him to borrow
- The students can even return the books through the Library Management System

2.4 Operating Environment

The Library Management System is an online web application which can be accessed with a good internet connection. We can access this through multiple ways like Computer, laptop or even Desktops. It is built on the cloud and accessed through the cloud.

2.5 Constraints

2.5.1 Development Limitations

In the case of certain features, few version errors might be possible as pycharm is the latest technology and the documentation available is very limited, which may cause compatibility errors with other features.

2.5.2 External link support

Various connections are required while building a project. Few browsers might not be compatible with each and every feature. Not only the browsers, but even Operating Systems can also miss these links.

2.6 User Documentation

The Online Library Management System is a web-based application that allows students and staff to access library resources from anywhere with an internet connection. The system provides an efficient and user-friendly platform for managing library resources, with features that cater to the needs of both staff and students.

2.6.1 Accessing the System:

To access the Online Library Management System, open a web browser and navigate to the URL provided by your institution. Enter your login credentials (username and password) to log in to the system.

2.6.2 User Roles:

There are two types of users in the system: admin and student. The admin has access to the staff interface, while students have access to the student interface.

2.6.3 Admin Interface:

The admin interface allows staff to manage library resources, add or issue books, and view registered students. To access the admin interface, log in to the system with your admin credentials.

2.6.4 Student Interface:

The student interface allows students to search for and borrow books, view their borrowing history, and check the status of their borrowed books. To access the student interface, log in to the system with your student credentials.

2.6.5 Search for Books:

To search for books, enter the book title or author in the search bar provided. You can also search for books using voice search, which is available on the search page. The system will automatically categorize books into different genres based on the title.

2.6.6 Borrow Books:

To borrow a book, click on the "Borrow" button next to the book title. You can borrow a maximum of three books at a time. You can check the status of your borrowed books on the "My Borrowing History" page.

2.6.7 Return Books:

To return a book, click on the "Return" button next to the book title on the "My Borrowing History" page. You must return the book within the due date, which is shown on the status page for each borrowed book.

2.7 Operations and Dependencies

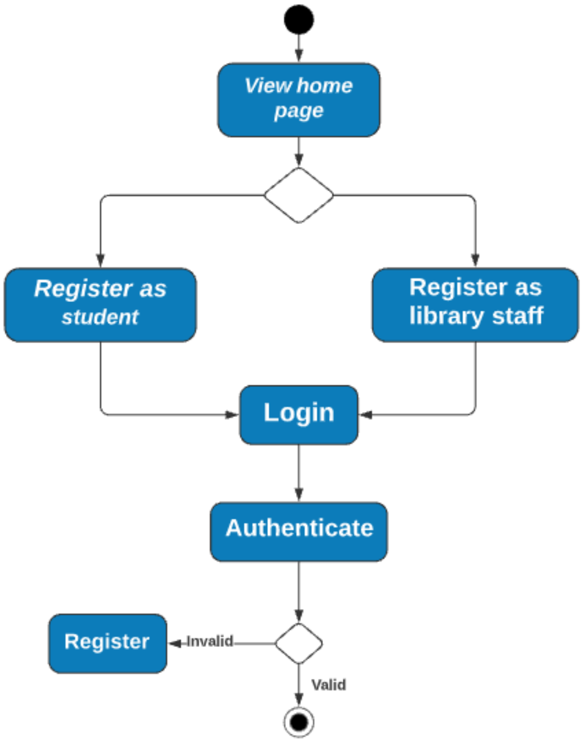
For an online library system to run smoothly and effectively, a number of interrelated processes and dependencies are required. An automated system for an online library's operations and dependencies is listed below:

- **Hardware -** To store, process, and transfer data, the computerized online library system needs hardware like servers, workstations, and network devices. The network must be dependable to guarantee connectivity, and the hardware must be strong enough to manage the system's demand.
- **Software -** Operating systems, database management systems, web servers, and application software are only a few of the different software elements that the system needs to function. To guarantee effective functioning, the software must be configured appropriately, compatible with the hardware of the system, and current.
- **Data Management -** To store, arrange, and retrieve data, the online library system needs effective data management. The information may be efficiently searched for and retrieved using a data management system that is built to guarantee data integrity, security, and privacy.
- **User Interface** - An integral part of the online library system is the user interface. It should be created with ease of use, functionality, and sensitivity to user needs in mind. Users should be able to quickly manage their accounts, borrow and return books, and conduct book searches on the interface

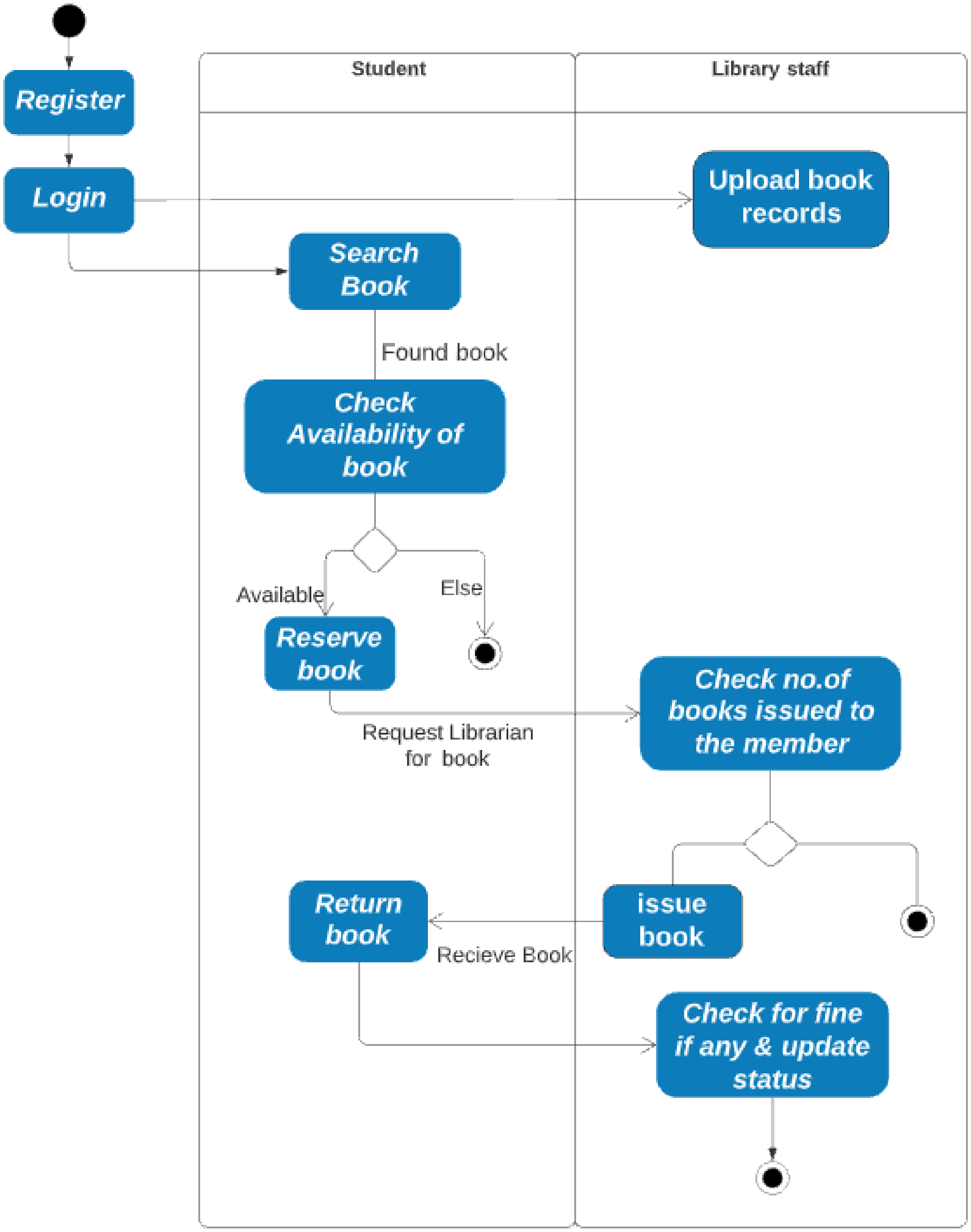
- **Security** - In order to guarantee data security, integrity, and availability, a computerized online library system must be secure. For the system to be sufficiently secure against unwanted access and data breaches, it should contain firewalls, intrusion detection systems, and access restrictions.
- **Support and Maintenance** - In order to maintain the system's smooth operation and effectiveness, it needs constant maintenance and care. Maintenance includes frequent software upgrades, hardware management, and user assistance to handle any problems or issues.

In conclusion, a system's smooth and effective functioning depends on a number of interrelated actions and dependencies that are involved in computerizing an online library system. To do this, the system needs the right hardware, software, data management, user interface, security, support, and maintenance.

2.8 Flow Diagram:



Flow diagrams are visual illustrations of step-by-step workflows and actions that include options, repetition, and simultaneous processes. A flow diagram is essentially a type of flowchart that depicts the sequence from one activity to another. An activity is a system operation that can be described as a function or process. The sequence of operations is represented by drawing lines connecting one activity to the next in the flow diagram.



This diagram outlines the various stages an object in the system goes through during its existence, with changes to its state triggered by events. The diagram illustrates the control flow as the object transitions from one state to another based on either internal or external events. States refer to the condition or status of the object, which changes when a particular event is activated.

3.1 External Interface Requirements

3.1.1 User Interfaces

The management and automation of various library duties and procedures through the use of computer technology is known as computerization of library activities. The methods by which library users engage with the computerized systems and services made available by the library are referred to as the external interface of computerization of library activities.

Users of libraries can search for works using keywords, titles, authors, subjects, and other search criteria utilizing the online public access catalog , a computerized listing of the library's holdings. Online public access catalogs are typically accessible from computers in libraries or online.

3.1.1.1 Home Page

A group of software packages or modules that are made to manage different parts of library operations often make up an internal interface for the online computerization of library activities. Some essential elements that could be present are as follows:
The library staff can build, manage, and update the catalog of books , and other items using the cataloging module. It often has tools for catalog searching, sorting, and filtering.

Library resources are lent and borrowed through the circulation module. The staff can use it to manage penalties and fees ,keep track of issue dates and the due dates, and check materials in and out.

3.1.1.2 Reports Module:

This module gives users access to reports and data on library operations. Reports on circulation, catalog usage, and other significant indicators might be included. This module assists in managing the library's electronic resources, including databases, books, and journals. It might have capabilities for authentication, access control, usage tracking, and reporting.

3.1.2 Hardware Interfaces

3.1.2.1 For Development :

- Processor: i5 and above
- RAM: 8GB
- HDD(Hard disk drive): 20 GB
- N/W Speed: 100 Gb/s

3.1.2.2 For Deployment:

- RAM: 4GB
- HDD(Hard disk drive): 512MB
- N/W Speed: 512 kb/s

3.1.3 Software Interfaces:

3.1.3.1 For Development:

- OS: Mac/Windows/Linux
- IDE: PyCharm
- Interface to manage PostgreSQL: pgAdmin

3.1.3.2 For Deployment:

- Any web browser

3.1.4 Communications Interface

3.1.4.1 Application Programming Interface (API):

An API is a collection of tools and protocols used to create software programs. A library management system and a book ordering system, for example, may be integrated via APIs so they can talk to each other and share data.

3.1.4.2 Websites for libraries:

Libraries offer users access to a range of digital resources, such as online databases, books, and journals.

3.1.4.3 Web Services:

An internet-based standard for two electronic devices to communicate with one another is called web services. Using the SOAP protocol or RESTful APIs, they enable data flow between various systems. To integrate library management, web services might be employed. Overall, the external interface of computerization in libraries has significantly increased the ways in which library users can access and use library resources, making library services more practical and accessible than ever.

3.2. FUNCTIONAL REQUIREMENTS:

3.2.1. New User Registration:

3.2.1.1. Description of feature:

All users have the option to use this feature to provide their contact information when creating accounts. This information includes name, email , address, and contact number.

3.2.1.2. Functional requirements 1.1

Possible feature for users to protect their account privacy is the ability to create strong passwords.

3.2.1.3. Functional requirements 1.2

The system must be able to validate data and establish whether all of the data was provided by the user, among other functional requirements.

3.2.2. User Login:

3.2.2.1. Description of feature:

The user logs into the system using this function. Before logging on, they must input their user ID and password for authentication. The user cannot access the system if they are invalid.
If a user forgets their password, the system should offer a mechanism to reset it. This is accomplished by sending a reset code to their cellphone number.

3.2.2.2. Functional requirements 2.1

When a user registers, they supply a user id. To access the system, the user must identify themselves with a valid user id and password. The system then executes an authorization procedure to determine what user level has access.

3.2.2.3. Functional requirements 2.2

The user must have the capacity to log out after they are done using the system. The system should restrict access to specific features or data based on the users role in the library system, such as a librarian or a user.

3.2.3. Search Book:

3.2.3.1. Description of feature

Both admins and students have access to this function. We may search for books using the book's ID, name, category, or author.

3.2.3.2. Functional requirements 3.1

The database must be searchable by the system using a chosen search type.

3.2.3.2. Functional requirements 3.2

The system displays comprehensive data about each book, including the title, author, release date, ISBN, publisher, and a synopsis. System must be able to filter books using entered keywords.

3.2.4 Admin User:

3.2.4.1 Register New Book:

3.2.4.1.1 Description of feature

With this feature, the administrator may include new books in the library.

3.2.4.1.2 Functional requirements 1.1
Information verification capabilities for systems are required.

3.2.4.1.3 Functional requirements 1.2
The database table must be able to accept entries from the system for book information and copy count.

3.2.4.1.4 Functional requirements 1.3
The system needs to be able to prevent two books from sharing the same book id.

3.2.5 Automatic Categorization:

3.2.5.1 Description of feature
When an administrator adds a book to the system, the system automatically categorizes it based on a variety of factors, including subject, genre, author, and publication date.

3.2.5.2. Functional requirements 5.1
Using the given book and author names, the system must be able to do an internet browser search. Also, it must be able to access the internet to obtain data about book categories.

3.2.5.3. Functional requirements 5.2
In order to label the category as "Education"; the system must be able to insert the extracted data into the database table.

3.2.6. Issue and Return Books:

3.2.6.1. Description of feature
This function enables the administrator to issue and receive books as well as see reports on books issued.

3.2.6.2. Functional requirements 6.1
The system needs to be able to add problem data to the database.

3.2.6.3. Functional requirements 6.2
The number of books must be updated by the system.

3.2.6.4. Functional requirements 6.3
The system must be able to verify that the book is available before distributing it.

3.2.6.5. Functional requirements 6.4
Information about the issue and return dates, with the return date set to 15 days, should be input table by the system.

3.2.6.6. Functional requirements 6.5
The system should set due dates for loaned books and notify users through email or their mobile device when they are past due.

3.2.6.7. Functional requirements 6.6
The system should keep track of returned books and make sure they are appropriately shelved in the library.

3.2.7 View Registered Students:

3.2.7.1. Description of feature
The admin can view a report of the students who have registered with the system thanks to this Function.

3.2.7.2 Functional requirements 7.1
The program must to have a search feature that enables the librarian to locate a particular student using their name or student ID number.

3.2.8. Fine Calculation:

3.2.8.1. Description of feature
This function figures out the penalty, if any. The admin will identify the students post the delay date and charge $5 for every day post the deadline.

3.2.8.2. Functional requirements 8.1
The system needs to be able to look up problems and return dates in the database.

3.2.8.3. Functional requirements 8.2
The system should be able to interact with the student information system to get the most recent data on enrolled students.

3.2.8.4. Functional requirements 8.3
The system must be able to properly compute the fine for the current date.

3.2.9. Student User

3.2.9.1. View Books Issued to the user :

3.2.9.1.1.Description of feature

The system should make it possible for the student to examine their personal data, including their name, student ID, contact details, and borrowing history. Students can view the books that have been issued to them using this function.

3.2.9.1.2. Functional requirements 9.1

If the item is not overdue and has not been requested by another user, the system should enable the student to renew it.

3.2.9.1.3. Functional requirements 9.2

The system should have the capacity to search the database for books that have been borrowed based on the user's request.

3.2.9.1.4. Functional requirements 9.3

The system must be able to display the borrowed books for the filtered student.

3.3 Performance Requirements

3.3.1 Response Time - As users search for books, borrow and return books, and manage their accounts, the system need to respond quickly.

3.3.2 Availability- Users should be able to use the system at any time, and it should be accessible around-the-clock. The system should be built to have as little downtime as possible, and any upgrades or maintenance work should be planned during off-peak times.

3.3.3 Scalability - The system must be scalable in order to manage an increase in users, transactions, and data without affecting its functionality. Hardware and software should be updated in accordance with the system's architecture to allow for future development.

3.3.4 Security - To secure against unauthorized access and security breaches, the system has to have strong security mechanisms in place. Data in transit and at rest should be protected by encryption in the system, and user access should be restricted by procedures for authentication and access control.

3.3.5 Usability - The interface should be simple, clear, and user-friendly. The system's user interface needs to be created with their needs in mind as well as offer simple, detailed instructions on how to operate it.

3.4 Design Constraints

3.4.1 Web support

Web requirement is a very important support which is needed as the entire application is built on cloud. Internet access and server maintenance are also major factors.

3.4.2 Language support

English being the well known famous language, the entire web-app is in english. Support of other languages might be difficult to achieve

3.4.3 Security

Every student has a unique enrollment number which indicates that the username and password associated with it is highly confidential. This data should be stored very securely as well

3.5 Other Requirements

3.5.1. Internal Interface Requirements :

A group of software packages or modules that are made to manage different parts of library operations often make up an internal interface for the online computerization of library activities.
Some essential elements that could be present are as follows:
The library staff can build, manage, and update the catalog of books, and other items using the cataloging module. It often has tools for catalog searching, sorting, and filtering.
Library resources are lent and borrowed through the circulation module. The staff can use it to manage penalties and fees ,keep track of issue dates and the due dates, and check materials in and out.

3.5.1.1. Reports Module:

This module gives users access to reports and data on library operations. Reports on circulation, catalog usage, and other significant indicators might be included.
This module assists in managing the library's electronic resources, including databases, books, and journals. It might have capabilities for authentication, access control, usage tracking, and reporting.

4. NON-FUNCTIONAL REQUIREMENTS:

4.1. Requirements Of Product :

4.1.1. Requirement Efficiency :

Staff members of Library and patrons will have quick access to books thanks to the computerization of library operations.

4.1.2. Reliability Requirement

The system should accurately handle member registration, member validation, book classification, transaction and search, and fine calculation, if necessary.

4.1.3. Demand for Usability

In order for both library users and staff to do their many tasks quickly and effectively, the the system has been designed to be user-friendly.

4.1.3.1.Performance:

While managing large volumes of data and users via the system, there shouldn&#39;t be any latency or delay.

4.1.3.2.Scalability:

The system ought to be able to handle future growth and usage surges without the need for significant upgrades or alterations.

4.1.3.3. Interoperability:

The system must be able to interface with other devices and programs that are often used in libraries, such as cataloging software or library management systems.

4.2. Organizational Requirements:

4.2.1. Implementation Requirements

The entire system is implemented using HTML as the front end and the Python Django framework as the back end. PostgreSQL will be utilized for database storage and the Django framework will be used for database connectivity.

4.2.2. Delivery Requirements

To finish the deliverable with complete front end implementations by the end of phase 1 of the project deliverable.

C. Development Phase Plan

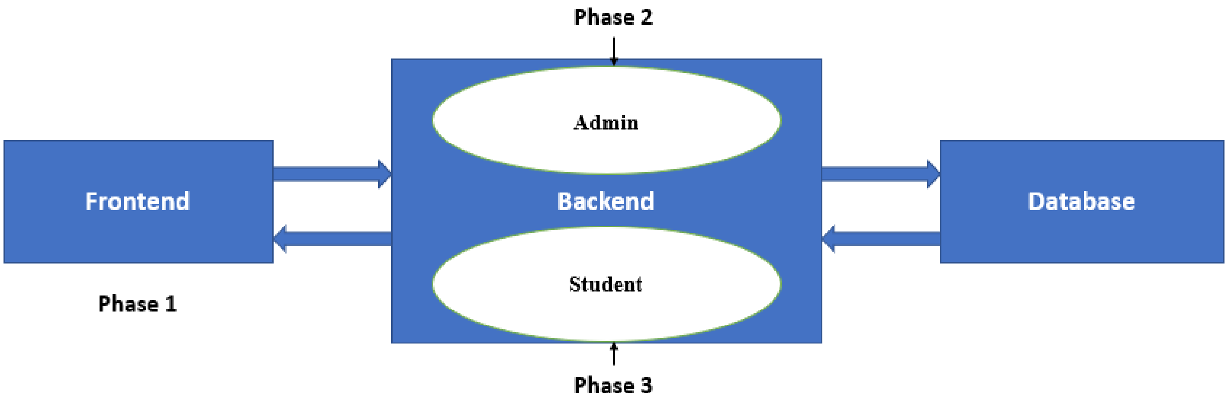


Fig3 : Diagram illustrating the division of phases

<u>Development phase 1</u>

- The phase 1 deliverable as per our plans is to complete the front end development of the project with designing and building the view pages to the students and the admins respectively and prepare a simple yet sophisticated interface to ease the usability of the project and it performs operations.

- We will use html, css and bootstrap to build the front end of the project and make it interactive for the users. Preparing the front end would give us a great idea as to what features are required and gives us a good picture of the connections and ports we need to use to communicate with the backend to implement either the get or post features accordingly.

  Expectations :
  - Homepage
  - Login Pages (Student and Admin)
  - Signup Pages (Student and Admin)
  - Admin interface for work functionality
  - Student interface for book search and book tracking
  - Testing

<u>Development phase 2</u>

- As for the backend implementation, we have divided it into two components, the admin and the student component, each of which will be acting as individual entities. For Phase 2, we plan to build the backend for the admin component, with its functionalities to login, register a new book, manage books in the library system and to supervise the students accessing and issuing books for themselves respectively.

- We will be using the Python Django framework to build the backend of the project with PostGre as the database. By the end of this phase, we intend for the project to function for the Admin component with its complete functionalities of registering, managing etc.

  Expectations :
  - Admin Login
  - Admin Signup
  - Admin Homepage
  - Registering books
  - Students view page
  - Book and Student Monitoring
  - Testing

<u>Development phase 3</u>

- We plan on doing the student component the second component of the two major components in the backend implementation in addition to the admin component, for this phase in the student component the user(students) are able to register as a new user (or) login in into their account if they are already an existing user where they are able to access the portal to check the available books and check their availability in the portal.

- They are able to use both the text and voice based search to search for the required books by providing the ISBN number of the specific book or providing the keywords that lists all the books associated with the keyword. The keyword can be the author name, book name or the publisher. The user is able to access and view the books that are already lent to him by the library and raise a request for the new book and view the lent and due date for all the lent books.The student is also able to return the book via this portal which needs to be approved by any admin.

- In addition to this we plan on using the due date to generate a fine based on the overdue date with a charge of $5 per day. And we will be using a payment gateway API to have the payment section feature for the student to pay the fines that he owes. Finally, we plan to test the system using unit testing and make a few tweaks for the final delivery.

  Expectations :
  - Student Login
  - Student Signup
  - Student Homepage

- Book Search
- Voice Based Search
- Payment Gateway
- Testing

Member's Contribution:

Member name	Contribution description	Overall Contribution (%)	Note (if applicable)
Ashraf Syed	Development for each phase, hardware, software requirements, report	14.3%	
Padmini Kuchukulla	Structure of the System - admin,student, System features, Formatting of report, Software Requirements Specifications, Table of contents	14.3%	
Abhijith Reddy Mandagiri	Introduction, system features, User documentation,Development of phase, report	14.3%	
Deepna Thalanki	Introduction, system design for login, admin pages, User Classes and Characteristics, Operating Environment, Design	14.3%	

	and Implementation Constraints		
Raghu Vamsi Kondapalli	Nonfunctional Requirements, functional Requirements	14.3%	
Vamsi Venkat Manepalli	Software Interfaces, Communications Interfaces, Functional Requirements	14.3%	
Sai Vishwak Jadala	User Interfaces, Hardware Interfaces, Assumptions and Dependencies	14.3%	