

# **IMPLEMENTATION OF STUDENT LIBRARY ASSISTANCE SYSTEM**

*Major project report submitted in partial fulfilment of the requirements for the degree of*

**Bachelor of Technology**

in

**Electronics and Communication Engineering**

*Submitted by*

**T ASHMITHA (18B81A0404)**

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**Department of Electronics & Communication Engineering**

**CVR COLLEGE OF ENGINEERING**

**(An Autonomous Institution & Affiliated to JNTUH)**

**Ibrahimpattanam (M), Ranga Reddy (D), Telangana**

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Cherabuddi Education Society's  
**CVR COLLEGE OF ENGINEERING**

(An Autonomous Institution)

ACCREDITED BY NATIONAL BOARD OF ACCREDITATION, AICTE

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## **CERTIFICATE**

This is to certify that the project titled “**IMPLEMENTATION OF STUDENT LIBRARY ASSISTANCE SYSTEM**” submitted to the **CVR College of Engineering**, affiliated to **JNTU, Hyderabad** by **T ASHMITHA (18B81A0404)**, **ADUWALA SAI PREETH (18B81A0434)**, **VANAPARTHI SRIRAM SANTHOSH (18B81A0443)** is a bonafide record of the work done by the students towards partial fulfilment of requirements for the award of the degree of **Bachelor of Technology in Electronics & Communication Engineering**.

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# ABSTRACT

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With the advancement of technology, majority of solutions are automated to meet the changing needs of the end users. The Student Library Assistance System (SLAS) acts as a tool to assist students regarding any book in library. In libraries, the students/user has to search for books which is a hassle process and there is no proper information of issues/fines provided to the students. The overall progress of work is slow and fast report can't be generated. The librarians have to work allotted for arranging, sorting books in the book sells. At the same time, they have to check and monitor the lend/borrow book details with its fine, which would be difficult and time consuming if many students are in queue.

SLAS will assist the students to find books and provide their availability easily. The students/users need not stand in a queue for a long period to return/borrow a book from the library. Students can also pre-order books. Fines applied on book borrowed by students can also be viewed by students to keep them informed. Librarian can access database and update required data.

The complete model is developed in HTML5, CSS, JavaScript and PHP, which are being used to build the front-end web application. Back-end part is built using MySQL database as data storage on xamp server. The system was developed using the V-Model software development approach. An extensive evaluation of the project determines that the project achieved many of its predefined objectives. Thus, the proposed model is completed and the result are satisfactory.

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# INTRODUCTION

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## 1.1 Background and Motivation

Accelerated technological advancements experienced in the 21<sup>st</sup> century have enabled automation of services delivered to the people across the globe. Currently, many libraries have embraced the trend of automating their services by providing rich electronic resources for research and other purposes to the public. CVR College of Engineering library was established in 2008. The library has grown immensely with collections expanded from 2000 to more than 80,000 volumes of books, e-book, as well as e-journals.

Despite having come this far, the institution has not yet fully automated their library services hence a need to replace the system with a fully automated online system that can be accessed by users remotely, from the comfort of their locations. My motivation to develop this system came from the increased need to access resources over the internet for purposes of research, increased information technological advancements that enables service automation, and the governments drive to digitize resources for extensive research in both public and private universities.

## 1.2 Problem Statement

The current system is operated manually. Student has to come to library to check whether a certain book is available or not. When he arrives to the library he needs to search where the book is, which is difficult as there are many books in library. After borrowing a book, in case they have any fines on a book, they'll have to contact librarian before returning the book. The manual system poses several challenges which include:

- i. It wastes a lot of time.
- ii. It's difficult to process large volumes of information concerning books.
- iii. Fines are computer generated, but not available for students.
- iv. A lot of physical work is involved hence more room and staff to handle them which translates to more costs.

- v. It's difficult to search where a book is sectioned in the library and its availability.

### **1.3 Project Goal**

The goal of coming up with this system was to design, develop, and implement a fully automated online library assistance system for students. The main purpose of this project is to automate all possible functionalities of the College library. This project used to manage the records of books available in the library, rack numbers and provides pre-booking facility. The development of new system contains advanced features. It helps both student and Librarian. This web application is capable of managing Book Issues, Returns, Search and view Fines. Generating various Reports for Record-Keeping according to end user requirements.

### **1.4 Project Objectives**

This system has a number of objectives:

- i. To develop a system that ensures the privacy of its users and enable them access it remotely.
- ii. To enable easy maintenance of members and book details.
- iii. To enable easy retrieval of books by simply searching the system.
- iv. To design a system that responds in a timely manner.
- v. To enable easy borrowing and returning of books.
- vi. To enable automated fine calculation and reports generation.
- vii. To enable a secure and portable database system that eliminates duplicate data.

### **1.5 Benefits of the Proposed System**

This system improves services delivered to students. Information can be searched from the system and the results displayed in a timely manner. Costs incurred are reduced by cutting down the number of library workforce. Data is saved in the most appropriate manner eliminating duplication and redundancy. Multiple users can access the system at the same time.

The system operates electronically hence ensures less space is occupied and also presents a paperless working environment. The system has access control limiting access to restricted areas. Student privacy is ensured by providing login functionality which verifies them to determine their authenticity to access the system. Library staff members are motivated by the system since it makes work easier. The system has a friendly user interface which is attractive and easy to use. Information concerning all the library activities is stored in the most secure manner. The system's database is password protected preventing unauthorized access and it can also be backed up easily. The system is easy to manage and administer and can be accessed remotely on any computer connected to the internet.

## 1.6 Hardware Project Overall System

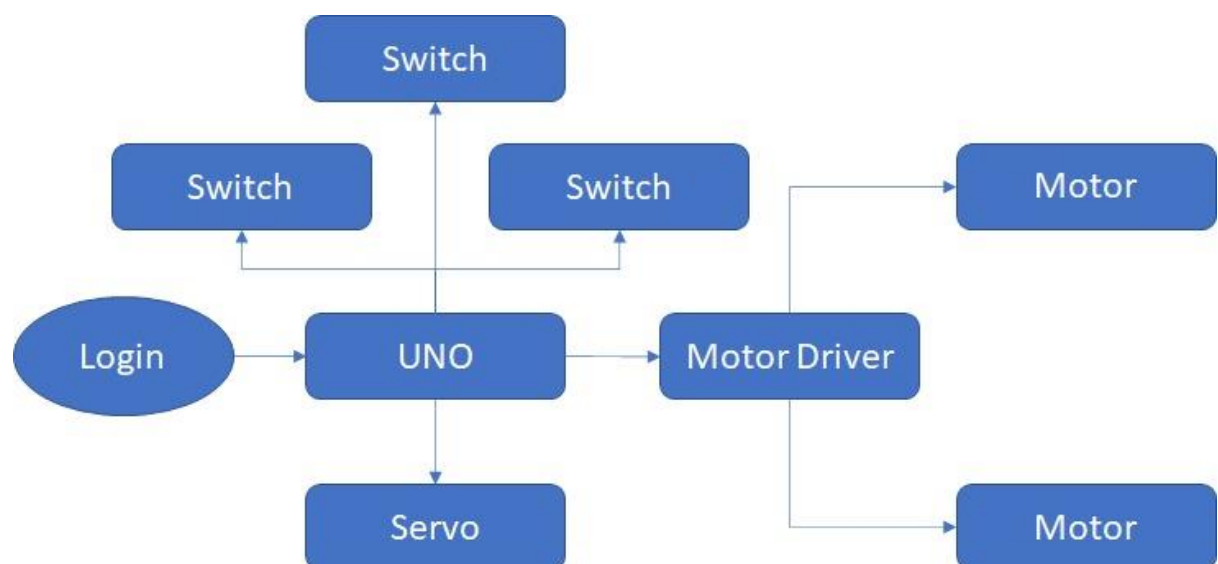


Figure 1.1: Block Diagram

Input is taken from the user and is given to the Arduino UNO. Depending on the received instructions the motor driver takes signals from Arduino and controls DC Motors. The two switches are used to determine the Rack number in which the book is placed and the Servo Motor tries to push the book. The third switch is used to check whether the book has fallen down.

## 1.7 Report Outline

The structure and layout of the thesis are as follows:

**Chapter 1– Introduction:** This chapter discusses a short introduction on the project which covers the objective of the project and project overall system.

**Chapter 2 – Literature Review:** This chapter describes what is the main idea and the existing spherical robot which have been developed by the previous researchers. It also consists of the information which will be the parameter for developing this project

**Chapter 3 – Methodology – System Analysis and Design:** This chapter discourses the methods used for developing the project and also approach taken in order to complete the project.

**Chapter 4 – Project Development-Software:** This chapter deliberates about the early conceptualization stage in designing of the webpage until it completion. Software tools would be highlighted.

**Chapter 5 – Project Development-Hardware:** This chapter deliberates about the early conceptualization stage in designing of the hardware model until it completion. Hardware tools would be highlighted.

**Chapter 6 – Results:** This chapter expresses the result and findings of the experiment. The findings results were analysed and discussed. The problem encountered in this project will be highlighted as well.

**Chapter 7 – Conclusion and Future Scope:** This chapter concludes the entire project and converse the augmentation that can be done for future project.



## LITERATURE REVIEW

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### 2.1 Introduction

This chapter reviews information about the Student Library Assistance Systems that have already been researched and developed together with the various approaches used by these systems. Online journals, articles, publications and books were used to provide information on this topic.

Libraries across the world present a conducive environment where people converge to do their research and study. Majority of these libraries are situated within the facilities of learning institution. These libraries play an important role in the entire operation of an institution.

Chweh S.S, 1981, in his journal titled “User criteria for evaluation of library service” outlined features of a good library. These include: Availability of periodicals, good collection of reference material, non-book materials and books, and the quality of reference services delivered, quite environment for studying, catalog integrity, how services are friendly and willingness of librarians to help.

Book lending systems were created way back in the past centuries even before the computer age. The French book wheel invention enabled scholars to circulate books by stepping on a pedal that turned a book table. Albert Cotgreave developed the book indicator back in 1863. It housed smaller versions of the books making it possible to tell the availability of the book, or if it was overdue. Automation of libraries began in 1930’s. This is when the punch card systems were used to manage book acquisition and circulation.

Gapen, 1993 notes; virtual library comprises aspect of remotely accessing services and content of other libraries, alongside other resources of information. The internet acts as a powerful tool through which materials can be made available for sharing and access by anyone across the globe. Libraries have accumulated resources that can provide a good source of information for research and other use. Making these rich resources available to the general public across the globe is of great advantage.

The aim of technological advancements is to make work easier and ensure efficiency is realized in all facets of life where it's applicable.

Aswal, 2006 notes; that library automation is the process of interconnecting systems to enable the sharing of information through networks hence providing access to large volumes of content and information to users across the globe. The use of the internet and networking has been emphasized a lot. A library needs the latest technology been used in the 21st century, hence, institutions need to phase out legacy systems, and embrace automation of all their services.

Johnson, Houda, & Tony., 2004 note that a virtual library can connect e-learners to online public library catalogues, resource rich databases which are licensed and electronic books, materials for research and learning. These virtual libraries allow users to access them around the globe and at any time so long as they are connected to the internet. The adoption of the Student Library Assistance System poses great benefits to the end users since the system aims at delivering automated services efficiently and effectively via the internet.

## **2.2 A Look at Automation of Libraries in Institutions of Learning**

Over the past years, Student Library Assistance Systems have been under rapid development. These online libraries are flexible because they offer a 24hrs access, and operate 7day a week, and 365 days a year. These library systems enable easy searching of material hence saving time.

Roberts, 1999, a Librarian at Cohen Hillel Academy points out that after automating their library services; the electronic catalogue was faster, versatile, and easier to use than the old card catalog which they used before automation. The new system encouraged both students and teachers to do more research by utilizing the resources offered. They used this program till 1998 when they decided to upgrade to the Follett Software Company's Circulation Plus and Catalog which was computerized. She notes that to motivate the library staff their workload must be simplified and the technology been used by the school streamlined. This system had a number of advantages:

- i. It increased interest in the library and enabled easy access to resources. This helped both the students and staff to find electronic resources more easily.

- ii. It presented a user-friendly technology; whereby the windows platform was easy to use with less training required. Location of material became easier and it was done promptly.
- iii. Reports were generated easily hence presenting library staff and students with the opportunity to manage library operations effectively.
- iv. The system presented a consistent learning environment and ease of maintenance.

A majority of libraries in India are found in research centers, private and public institutions of learning. Public universities have the highest volumes of books, journals, research papers, and other collections. The libraries were set up with the main aim of been used by both the students, teachers, lecturers and staff members within the institution. There has been a collected effort by the library management to restructure their services so as to extend them to other outsiders other than the normal users.

Amollo, 2011 highlighted the relevance of digitizing libraries as:

- i. It improves and widens access to electronic collections done by other digital libraries.
- ii. It enhances the lifetime of information material.
- iii. It encourages and facilitates sharing of resources amongst libraries across the world.
- iv. It reduces duplication of work.

Student Library Assistance System is an online system, which enables its users to access it round the clock. It has an added functionality for users to feel they are part of the system by displaying their profile on login and enabling them to update their details.

## **2.3 Functionalities of Automated Library Systems**

A good number of Student Library Assistance Systems suppliers have come together with the aim of integrating a number of functionalities. These include:

- i. The inter library loan modules, incorporated in the circulation system.
- ii. Online Public Access Catalogs providing search functionality.
- iii. Incorporating resource management software and reading list within OPACs.
- iv. Sending users reminders on reservations by using integrated computer telephony.
- v. Serials check-in using Electronic Packing Slip.

- vi. The use of Radio Frequency Identification technology for checking stock. The use of RFID tags to track library material.

Felstead, 2004, points out functionalities developed by a number of Library Managements Systems developers. They comprise of:

- i. Developing digital solutions aimed at managing libraries.
- ii. Development of portal programs with the aim of offering users a centralized place to search resources at ago.
- iii. Use of Open URL technology that offer links to reference materials and other useful resources.
- iv. Development of electronic resource managing solutions that control licensing and subscription of information and resources respectively.

# METHODOLOGY– SYSTEM ANALYSIS AND DESIGN

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## 3.1 Introduction

To develop a best fit system to the library, there are three stages of developing the new system. They are gathering information, design and implementation and final testing. Within these three sections, different tactics will be adopted so that we can design a system that can maintain high usability and accessibility. Below are some ideas to the process.

## 3.2 Information Gathering

Before setting up the system by software development tools, information will be gathered from the staff about the need for the users of the system like the staff of library and those readers by using qualitative gathering techniques (oral interviews). Before starting to implement the system, interviews will be made to get readers view on the system before having the design works being done.

After considering the scope and the objectives of this study, it is very much ideal to use the qualitative gathering techniques method i.e., the survey method, using the oral interview.

Interviews would be done to investigate and identify the scenario that libraries were going through in embarking on automation projects having embraced library automation.

The library is a major means of data gathering and as well a case study for the proposed system. In line with this the major method of information gathering for the system is the library and observation method via observing the staff and operation of the library.

## 3.3 Analysis of Existing System

The existing system of Student Library Assistance System involves lots and lots of book data not available for students. The system involves students to know their fines in person

rather than knowing in advance and getting informed about due date. To borrow book from a library, borrower has to search library to know which section the book is located or ask librarian about it.

### **3.3.1 Problems of existing system**

Having the overview knowledge of the existing system, the following are its problems

- i. Loss of Track of Due Date: Students can't know the total amount of fine issued on a borrowed book until they physically come to the library.
- ii. Time Wasting: Student time is wasted as a result of searching for a book that has been borrowed by other students.
- iii. Error Prone: The existing system of operation is prone to error.
- iv. Tedious: It is tedious because it must take a routine
- v. Processing Speed: The processing speed is very low resulting into low output.

### **3.3.2 Description of Proposed system**

The student library assistance system is a web-based application system which can be used by students as a system to keep informed about books stored in the library and also fines issued on them. It has the following features.

- i. Any student can access the website to know what books are available in library.
- ii. The location of the book in the library can also be known.
- iii. Fines issued on students can be known by students.
- iv. Students can pre-order a book in advance.
- v. Admin can view/edit any information of any student and any book.

### **3.3.3 Advantages of Proposed system**

Certain merits have been associated with the proposed system which enhances the design of the system. Some of which are stated below:

- i. It eliminates the presence of librarian for student to get a book
- ii. It is free from biasness (all users are served equally).
- iii. It provides an immediate form of response to every student.
- iv. It facilitates easy searching
- v. It keeps student informed about fines they have.

### **3.4 Design and Implementation Methodology**

The design methodology used in the proposed system is parallel as a result of the fact that parallel methods support the use of the proposed system side by side with the existing system in order to test for the system efficiency. Top-down approach is used as well in the design because it allows the analysis of the system to be carried out one after the other.

In this stage, the first goal will be decided by task analysis. Next, the prototype of the system will be analyzed. Then test will be made on its usability and design with some design theories. Thus, the prototype will be correspondingly looked at. Then a more complete prototype will be tested by potential users to collect feedbacks. Finally, the system will be finalized with the amendment on some problems of the user interface.

#### **3.4.1 Software Requirements**

- i. Operating system- Windows 8 is used as the operating system as it is stable and supports more features and is more user friendly
- ii. Database MYSQL-MYSQL is used as database as it easy to maintain and retrieve records by simple queries which are in English language which are easy to understand and easy to write.

Development tools and Programming language- HTML is used to write the whole code and develop webpages with cascading style sheet, java script for styling work and hypertext pre-processor (PHP) for sever side scripting.

### 3.4.2 Software tools used

The whole Project is divided in two parts the front end and the back end.

#### 3.4.2.1 FRONT END:

The front end is designed using of HTML, PHP, CSS, Java script

##### i. HTML

HTML or Hyper Text Mark-up Language is the main mark-up language for creating web pages and other information that can be displayed in a webbrowser.HTML is written in the form of HTML elements consisting of tags enclosed in angle brackets (like <html>), within the web page content.

The purpose of a web browser is to read HTML documents and compose them into visible or audible web pages. It provides a means to create structured documents by denoting structural semantics for text such as headings, paragraphs, lists, links, quotes and other items. It can embed scripts written in languages such as JavaScript which affect the behavior of HTML web pages.



Figure 3.1: HTML Logo



## ii. CSS

Cascading Style Sheets (CSS) is a style sheet language used for describing the look and formatting of a document written in a mark-up language. While most often used to style web pages and interfaces written in HTML and XHTML, the language can be applied to any kind of XML document, including plain XML, SVG and XUL. CSS is a cornerstone specification of the web and almost all web pages use CSS style sheets to describe their presentation. CSS is designed primarily to enable the separation of document content from document presentation, including elements such as the layout, colors, and fonts.



Figure 3.2: CSS Logo

This separation can improve content accessibility, provide more flexibility and control in the specification of presentation characteristics, enable multiple pages to share formatting, and reduce complexity and repetition in the structural content (such as by allowing for table less web design). CSS can also allow the same mark-up page to be presented in different styles for different rendering methods, such as on-screen, in print, by voice (when read out by a speech-based browser or screen reader) and on Braille-based, tactile devices. It can also be used to allow the web page to display differently depending on the screen size or device on which it is being viewed.

### **iii. JAVA SCRIPT**

JavaScript (JS) is a dynamic computer programming language. It is most commonly used as part of web browsers, whose implementations allow client- side scripts to interact with the user, control the browser, communicate asynchronously, and alter the document content that is displayed. It is also being used in server-side programming, game development and the creation of desktop and mobile applications. JavaScript is a prototype-based scripting language with dynamic typing and has first- class functions. Its syntax was influenced by C. JavaScript copies many names and naming conventions from Java, but the two languages are otherwise unrelated and have very different semantics. The key design principles within JavaScript are taken from the self and Scheme programming languages. It is a multi- paradigm language, supporting object-oriented, imperative, and functional programming styles.



Figure 3.3: JavaScript Logo

### **iv. PHP**

PHP is a server-side scripting language designed for web development but also used as a general-purpose programming language. PHP is now installed on more than 244 million websites and 2.1 million web servers.

Originally created by Rasmus Lerdorf in 1995, the reference implementation of PHP is now produced by The PHP Group. While PHP originally stood for Personal Home Page, it now stands for PHP: Hypertext Pre-processor, a recursive backronym code is interpreted by a web server with a PHP processor module, which generates the resulting web page: PHP commands can be embedded directly into an HTML source document rather than calling an external file to process data. It has also evolved to include a command-line interface capability and can be used in standalone graphical applications. PHP is free software released under the PHP License. PHP can be deployed on most web servers and also as a standalone shell on almost every operating system and platform, free of charge.



Figure 3.4: PHP Logo

### **3.4.2.2 BACK END**

The back end is designed using MySQL which is used to design the databases

#### **i. MYSQL**

MySQL ("My S-Q-L", officially, but also called "My Sequel") is (as of July 2013) the world's second most widely used open-source relational database management system (RDBMS). It is named after co-founder Michael Widenius daughter, My. The SQL phrase stands for Structured Query Language. The MySQL development project has made its source code available under the terms of the GNU General Public License, as well as under a variety of proprietary agreements. MySQL was owned and sponsored by a single for-profit firm, the Swedish company MySQL AB, now owned by Oracle Corporation. MySQL is a popular choice of database for use in web applications, and is a central component of the widely used LAMP

open-source web application software stack (and other 'AMP' stacks). LAMP is an acronym for "Linux, Apache, MySQL, Perl/PHP/Python.



Figure 3.5: MySQL Logo

" Free-software-open-source projects that require a full-featured database management system often use MySQL. For commercial use, several paid editions are available, and offer additional functionality. Applications which use MySQL databases include: TYPO3, MODx, Joomla, WordPress, phpBB, MyBB, Drupal and other software. MySQL is also used in many high-profile, large-scale websites, including Wikipedia, Google (though not for searches), Facebook, Twitter, Flickr, and YouTube.

### 3.4.3 Hardware Requirements

- i. Intel core i5 2nd generation is used as a processor because it is fast than other processors and it is very reliable and we can as well run our pc for long time with the Intel core i5. By using this processor, we can keep on developing our project without any worries.
- ii. Ram 4 GB is used as it will provide fast reading and writing capabilities and will in turn support in processing.

## PROJECT DEVELOPMENT – SOFTWARE

---

### 4.1 System Development Approach

System Development Life Cycle (SDLC) is referred to a methodology for developing systems. It produces a consistent frame work of tasks and deliverables needed to develop systems. The SDLC methodology may be condensed to include automated or manual, whether it is a new system, or an enhancement to existing system. The SDLC methodology tracks a project from an idea developed by the user through feasibility study, systems analysis and design, programming, pilot testing, implementation and post implementation analysis,

The development method that intends to use for the Student Library Assistance System is the V- model which may be considered as an extension of the waterfall model, it offers a mean of making the development process more visible. A system prototype can be developed to give end-user a concrete impression on the system capabilities. System life cycle is an organizational process of developing and maintaining systems, its helps in establishing a system project plans because it gives overall list of process and sub processes required developing a system.

System Development Life Cycle means combination of various activities. In other words, various activities put together are referred to as system development life cycle. In the system analysis and design terminology system development life cycle is known to be Software Development Life Ccle, the following are the different phases of Software Development Life Cycle.

Software concept, Requirement analysis, Architectural design, Coding and debugging, System testing, Implementation, Maintenance.

## 4.2 V - MODEL

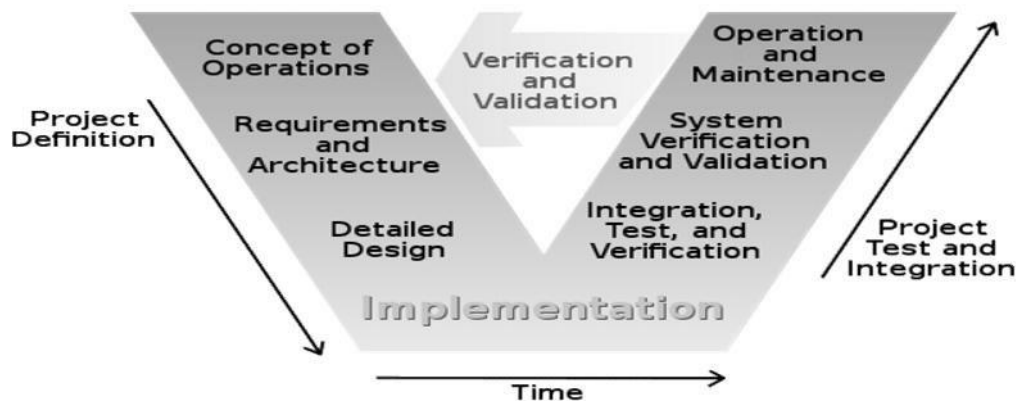


Figure 4.1: V-model

The V model represents a software development process (also applicable to hardware development) which may be considered an extension of the waterfall model. Instead of moving down in a linear way, the process steps are bent upwards after the coding phase, to form the typical V shape. The V-Model demonstrates the relationships between each phase of the development life cycle and its associated phase of testing. The horizontal and vertical axes represent time or project completeness (left-to-right) and level of abstraction (coarsest- grain abstraction uppermost), respectively.

### 4.2.1 Requirement analysis and system design

The requirements of the system are collected by analyzing the needs of the user(s). This phase is concerned with establishing what the ideal system has to perform. However, it does not determine how the software will be designed or built. Usually, the users are interviewed and a document called the user requirements document is generated.

The user requirements document will typically describe the system's functional, interface, performance, data, security, etc. requirements as expected by the user. It is used by business analysts to communicate their understanding of the system to the users. The users carefully review this document as this document would serve as the guideline for the system designers in the system design phase. The user acceptance tests are designed in this phase. There are different methods for gathering requirements of both soft and hard methodologies including; interviews, questionnaires, document analysis, observation, throw-away prototypes, use cases and static and dynamic views with users. The requirement documentation will be

referred throughout the rest of the system development process to ensure the developing project along with the need and requirements.

Systems design is the phase where system engineers analyze and understand the business of the proposed system by studying the user requirements document. They figure out possibilities and techniques by which the user requirements can be implemented. If any of the requirements are not feasible, the user is informed of the issue. A resolution is found and the user requirement document is edited accordingly. The software specification document which serves as a blueprint for the development phase is generated. This document contains the general system organization, menu structures, data structures etc. It may also hold example business scenarios, sample windows, reports for the better understanding. Other technical documentation like entity diagrams, data dictionary will also be produced in this phase. The documents for system testing are prepared.

#### **4.2.2 Architectural design**

The phase of the design of computer architecture and software architecture can also be referred to as high-level design. The baseline in selecting the architecture is that it should realize all which typically consists of the list of modules, brief functionality of each module, their interface relationships, dependencies, database tables, architecture diagrams, technology details etc. The integration testing design is carried out in the particular phase. After the requirements have been determined the necessary specifications for the hardware, software and people and data resources and the information products that will satisfy the functional requirement of the proposed system can be determined. The design will serve as a blueprint for the system before these errors or problems are built into the system.

#### **4.2.3 Module design**

The module design phase can also be referred to as low-level design. The designed system is broken up into smaller units or modules and each of them is explained so that the programmer can start coding directly. The low-level design document or program specifications will contain a detailed functional logic of the module in pseudo code:

- i. Database tables, with all elements, including their type and size.

- ii. All interface details with complete API references.
- iii. All dependency issues.
- iv. Error message listings.
- v. Complete input and outputs for a module.

The unit test design is developed in this stage.

#### **4.2.4 Validation phases**

In the V-model, each stage of verification phase has a corresponding stage in the validation phase. The following are the typical phases of validation in the V- Model, though they may be known by other names.

##### **4.2.4.1 Unit testing**

In the V-Model, Unit Test Plans (UTPs) are developed during module design phase. These UTPs are executed to eliminate bugs at code level or unit level. A unit is the smallest entity which can independently exist, e.g., a program module. Unit testing verifies that the smallest entity can function correctly when isolated from the rest of the codes/units.

##### **4.2.4.2 Integration testing**

Integration Test Plans are developed during the Architectural Design Phase. These tests verify that units created and tested independently can coexist and communicate among themselves. Test results are shared with customer's team.

##### **4.2.4.3 System testing**

System Tests Plans are developed during System Design Phase. Unlike Unit and Integration Test Plans, System Test Plans are composed by client's business team. System Test ensures that expectations from application developed are met. The whole application is tested for its functionality, interdependency and communication. System Testing verifies that



functional and non-functional requirements have been met. Load and performance testing, stress testing, regression testing, etc. are subsets of system testing

#### 4.2.4.4 User acceptance testing

User Acceptance Test (UAT) Plans are developed during the Requirements Analysis phase. Test Plans are composed by business users. User Acceptance Testing is performed in a user environment that resembles the production environment, using realistic data. User Acceptance Testing verifies that delivered system meets user's requirement and system is ready for use in real time

### 4.3 Data flow diagrams

#### 4.3.1 Admin login

After entering to the home page of the website, librarian can choose the ADMIN LOGIN option where they are asked to enter username and password, and if he/she is a valid user then a login page will be displayed.

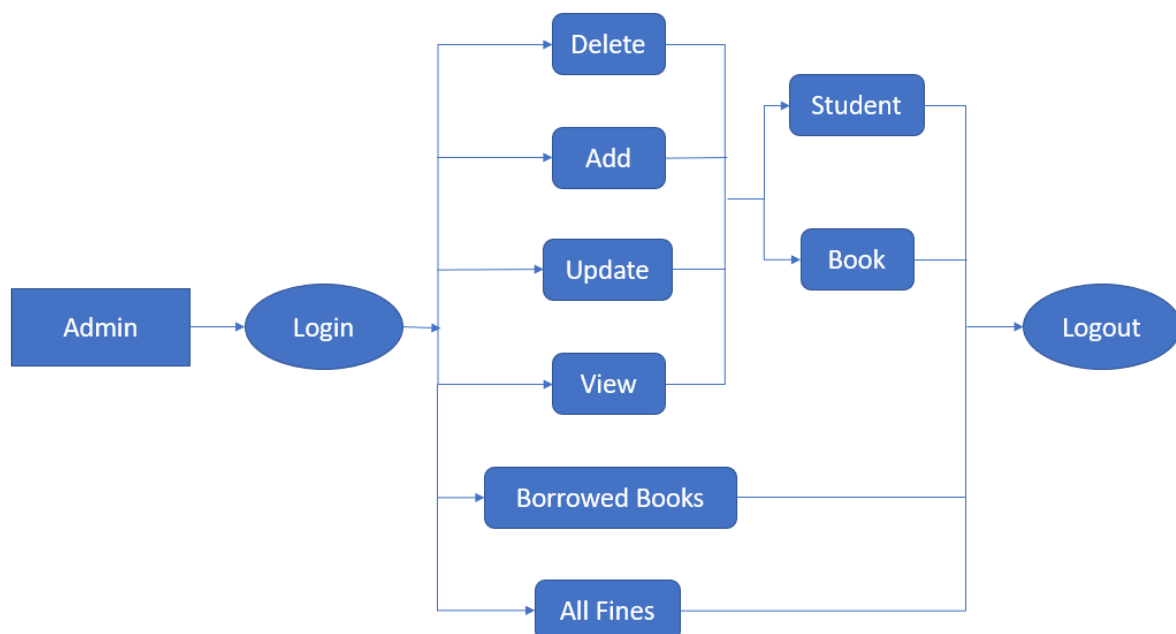


Figure 4.2: Dataflow diagram for admin login

### 4.3.2 Student login

After entering to the home page of the website, student can choose the STUDENT LOGIN option where they are asked to enter username and password, and if he/she is a valid student then a student login page will be displayed.

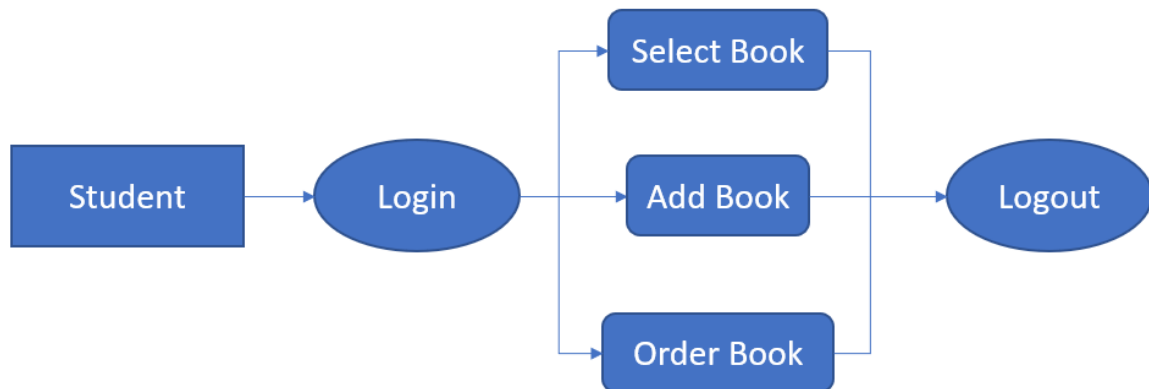


Figure 4.3: Dataflow diagram for Student login

### 4.3.3 Borrow Book

The book borrow Data Flow Diagram is the one where after entering STUDENT LOGIN page student can select a book borrow option where after entering the book detail, the student can select the book borrow option and if the maximum no of books borrowed limit is not crossed then a book can be borrowed. Any student is entitled to borrow three maximum books at a time else the user cannot borrow more then. In the borrowing of books, a user will be prompt with the due date.



Figure 4.4: dataflow diagram for book borrows

#### 4.3.4 Search Book

After the home page, there will be an option of the book search where after entering book detail like author name, publication, book name etc. book details will be displayed. Student can also minimize the search range by selecting book's relative category.



Figure 4.5: Dataflow diagram for book search

#### 4.3.5 View Fine

After the home page login there will be an option of CREATE AN ACCOUNT where after entering student detail, if all the fields are filled then a request will be sent to the librarian who will approve him as a registered member of the library.



Figure 4.6: Dataflow diagram for account creation

#### **4.3.6 Final Testing**

When the product is finalized, it will be run on a real-world environment and test on its performance. If the performance is satisfactory, it will be applied, else amendment will be made to correct the problems. After the system has been run for daily operation, continued maintenance and administration should be carried out to handle any system errors and security issues.

This will entail the pre-test, validity test, pilot and reliability test and the data survey.

## PROJECT DEVELOPMENT – HARDWARE

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### 5.1 System Overview

The objective of the development of a prototype robot is to investigate the applied movement methods. The system consists of the one main components: the prototype mother controller. The prototype robot is equipped with several components, where you will go through a detailed explanation.

### 5.2 Block Diagram and Components

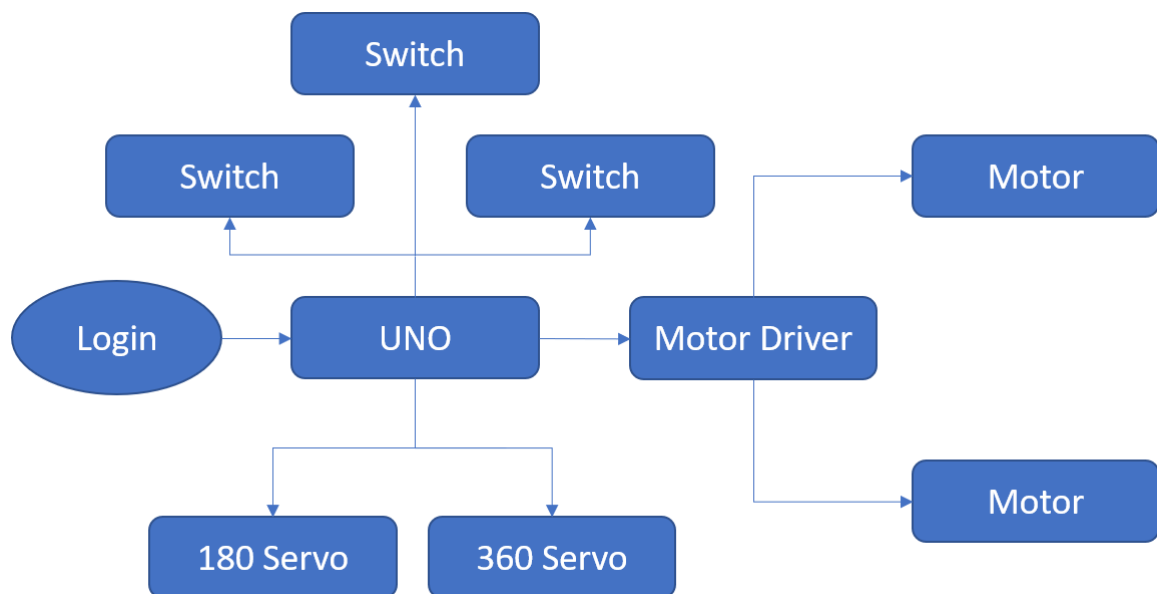


Figure 5.1: Block Diagram

#### 5.2.1 Components of Block Diagram

##### 5.2.1.1 DC Motors:

The DC motors are used to rotate the sphere and was installed at the horizontal centre axis of the sphere. The speed controller was used to change the speed and rotational direction of the DC motor, allowing the robot to move forward or backward

This DC Motor with Metal Gear Head is generally used in various robotics applications, it has following electrical and mechanical specifications.

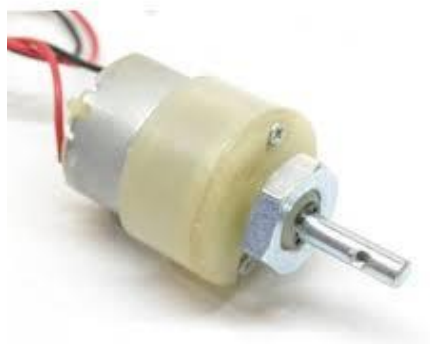


Figure 5.2: DC Motors

## Specifications:

Table 5.1: Specifications of DC Motor

Motor Type	DC with Gear Box, Metal Gears
Base Motor	DC 3000 RPM
Shaft Type	Circular 6mm Diameter with Internal Hole for coupling, 23 mm shaft Length
Maximum Torque:	~3 Kg-cm at 12V
RPM	100 RPM at 12V
Weight	130 gms
MaxLoad Current:	~330mA at 12V

Table 4.1: DC Motor Specifications

### 5.2.1.2 L298N Motor Driver

An H bridge is an electronic circuit that enables a voltage to be applied across a load in either direction. These circuits are often used in robotics and other applications to allow DC motors to run forwards and backwards. H bridges are available as integrated circuits, or can be built from discrete components.

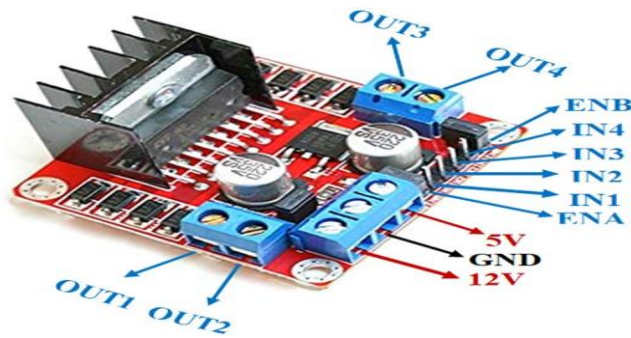


Figure 5.3: L298N Motor Driver

## Specifications:

Table 5.2: Specifications of L298N Motor Driver

Double H Bridge Drive Chip	L298N
Logical Voltage	5V
Drive Voltage	5V-35V
Logical Current	0-36Ma
Drive Current	2A (Max single Bridge)
Max Power	25W

### 5.2.1.3 ARDUINO UNO



Figure 5.4: Arduino UNO

**Arduino Uno** is a microcontroller board based on the ATmega328P. It has 14 digital input/output, a USB connection, a power jack, an ICSP header and a reset button. It contains everything needed to support the microcontroller; simply connect it to a computer with a USB cable or power it with an AC-to-DC adapter or battery to get started.

## Specifications:

Table 5.3: Specifications of Arduino

Microcontroller	Microchip ATmega328P
Operating Voltage	5V
Input Voltage	7 – 20V
Digital I/O Pins	14
Analog Input Pins	6
DC Current per I/O Pin	20Ma
DC Current for 3.3V Pin	50mA
Flash Memory	32KB of which 0.5KB used by bootloader
SRAM	2KB
EEPROM	1KB
Clock speed	16MHz

### 5.2.1.4 MG995 Servo Motor

**MG995** is a **servo motor** that is popular for its performance and low price. The motor is used in many applications mainly being robotics and drones.

**MG995** has three terminals as mentioned in pin diagram and the function of each pin is given below.



Figure 5.5: MG995 Servo Motor



## MG995 Features and Electrical characteristics

- Metal geared servo for more life
- Stable and shock proof double ball bearing design
- High speed rotation for quick response
- Fast control response
- Constant torque throughout the servo travel range
- Excellent holding power

### Specifications:

Table 5.4: Specifications of MG995

Operating Voltage	4.8 V to 7.2 V
Stall torque	9.4kg/cm (4.8v); 11kg/cm (6v)
Operating speed	0.2 s/60° (4.8 V), 0.16 s/60° (6 V)
Rotational degree	180°
Dead band width	5μs
Operating temperature range	0°C to +55°C
Current draw at idle	10mA
No load operating current draw	170mA
Current at maximum load: 1200Ma	1200Ma

### 5.2.1.5 Battery

#### I. 9V Battery

The nine-volt battery, or 9-volt battery, is a common size of battery that was introduced for the early transistor radios. It has a rectangular prism shape with rounded edges and a polarized snap connector at the top.



Figure 5.6: 9V Battery

#### II. 12V Battery

These batteries can provide hundreds of amps of electrical current for a short period of time. That is why these batteries are commonly used in automotive applications.



Figure 5.7: 12V Battery

## 7. Voltage Regulator ( 5 Volts)

LM338 is a three terminal positive voltage regulator with capability of delivering 5 Amps current over 1.2 V to 32 V output range. It requires only two External Resistors to decide the output voltage and it will provide good load and line regulation..



Figure 5.8: 5V Voltage Regulator

## 8. MG996R Robot servo 360° Rotation

Digital metal gear servo for Robotic, clockwise/counter-clockwise rotation Digital servo.



Fig 5.9: MG996R Servo 360° Rotation

### Specification:

Weight: 55g

Dimension: 40.7×19.7×42.9mm

Stall torque: 9.4kg/cm (4.8v); 11kg/cm (6.0v)

Operating speed: 0.19sec/60degree (4.8v); 0.15sec/60degree (6.0v)

Operating voltage: 4.8~ 6.6v

Gear Type: Metal gear

Temperature range: 0- 55°C

### 5.3 Circuit diagram:

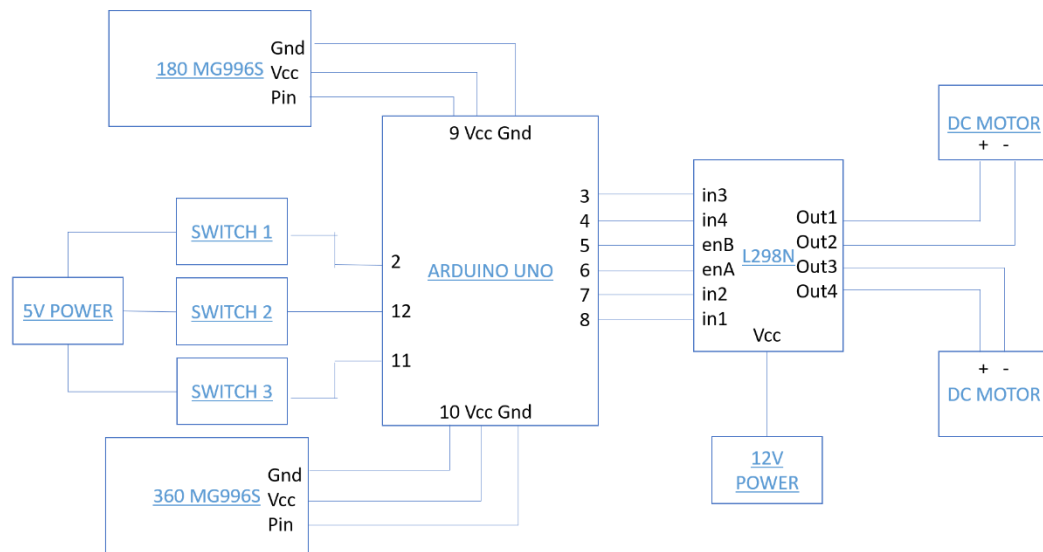


Figure 5.10: Hardware Circuit Diagram

Table 5.5: L298N, MG996S and Arduino UNO Pin Configuration

MG996S	UNO	L298N	DC Motor	External	Switch
GND	GND	GND			
		Vcc		12V	
5V	5V				
	3.3V				
	D13				
	D12				
	D11			5V	3
	D10			5V	2
PWM	D9				
	D8	IN1			
	D7	IN2			
	D6	ENA			
	D5	ENB			
	D4	IN4			
	D3	IN3			
	D2			5V	1
	D1				
		OUT 1 / 4	(+)		
		OUT2 / 3	(-)		

### 6.1 Software

This web application is used for the automation of library system. This web application is capable of managing Book Issues, Returns, pre-order, check availability, fines and rack number of the book that they need. It generates various Reports for Record-Keeping according to end user requirements.

#### 6.1.1 Website Overview

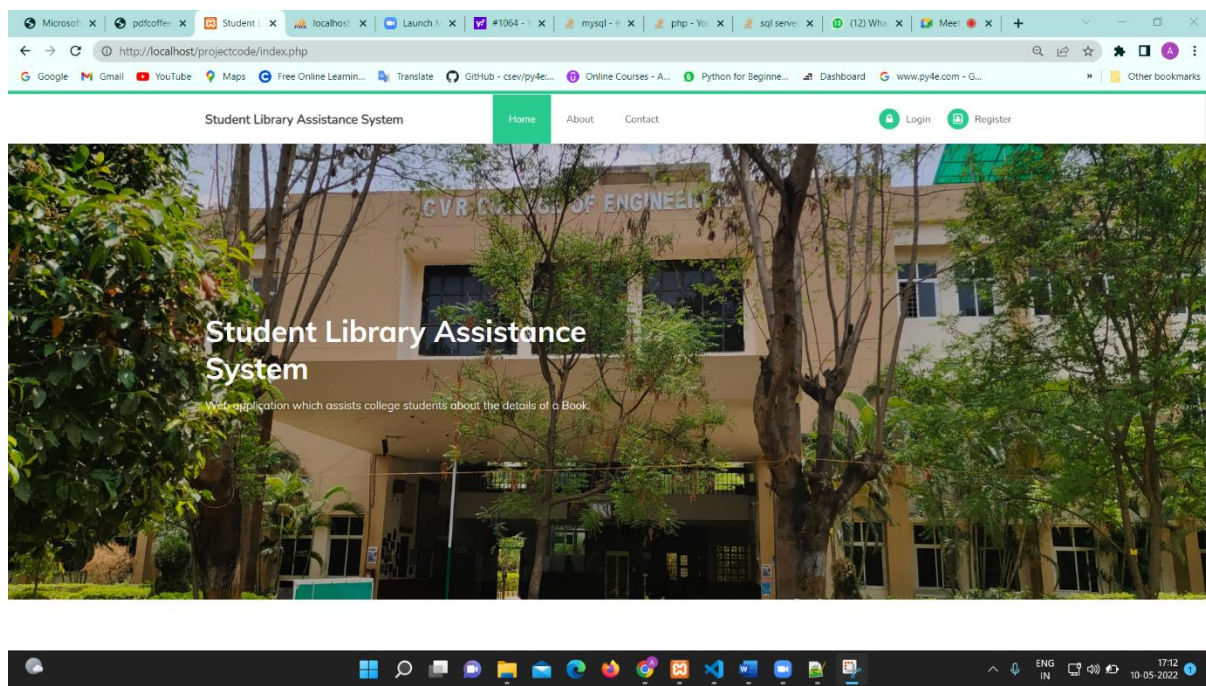


Figure 6.1: Webpage Overview

Figure 6.1 displays various options in the navigation bar which include Home, About the webpage, Contact details, Login and Register.

#### 6.1.2 Registration Panel

We can register as student and Admin/Librarian. Students need to login with their roll numbers so that requests from only valid numbers would be accepted by the admin.

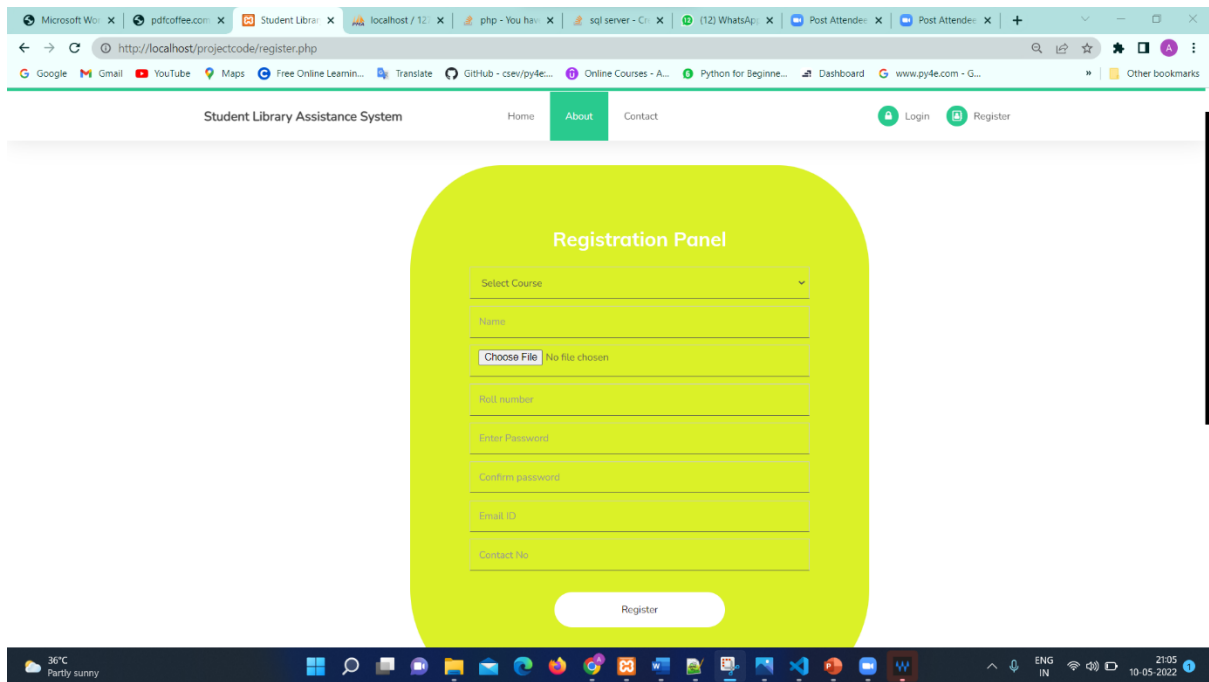


Figure 6.2: Registration Panel

### 6.1.3 Login Panel

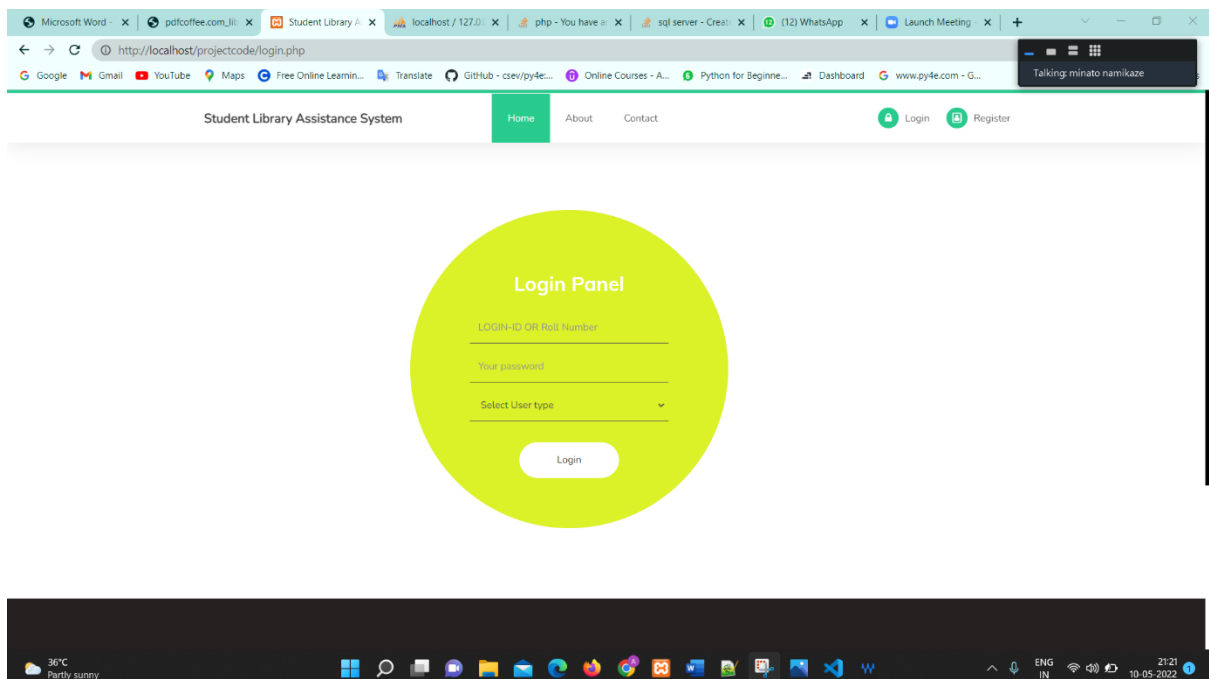


Figure 6.3: Login Page

## 6.1.4 Student login Homepage

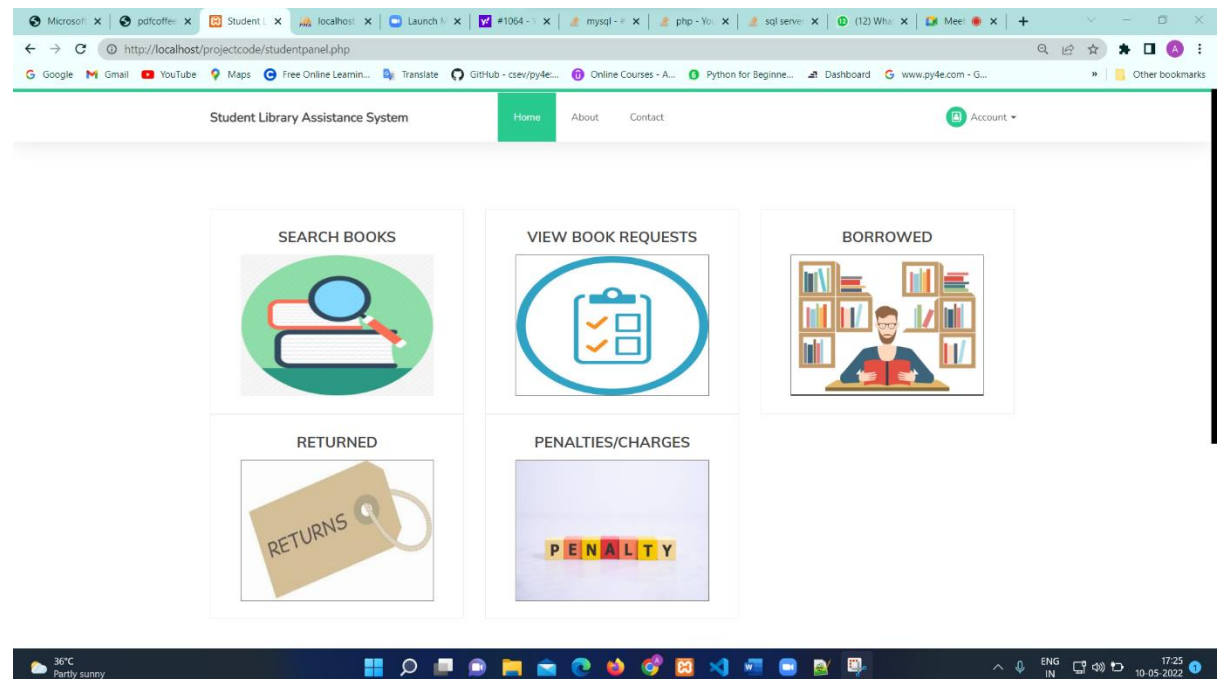


Figure 6.4 Student Homepage

In figure6.4 student can search for books, view books record, borrowed record, returned books and also the fines.

### 6.1.4.1 Search Books

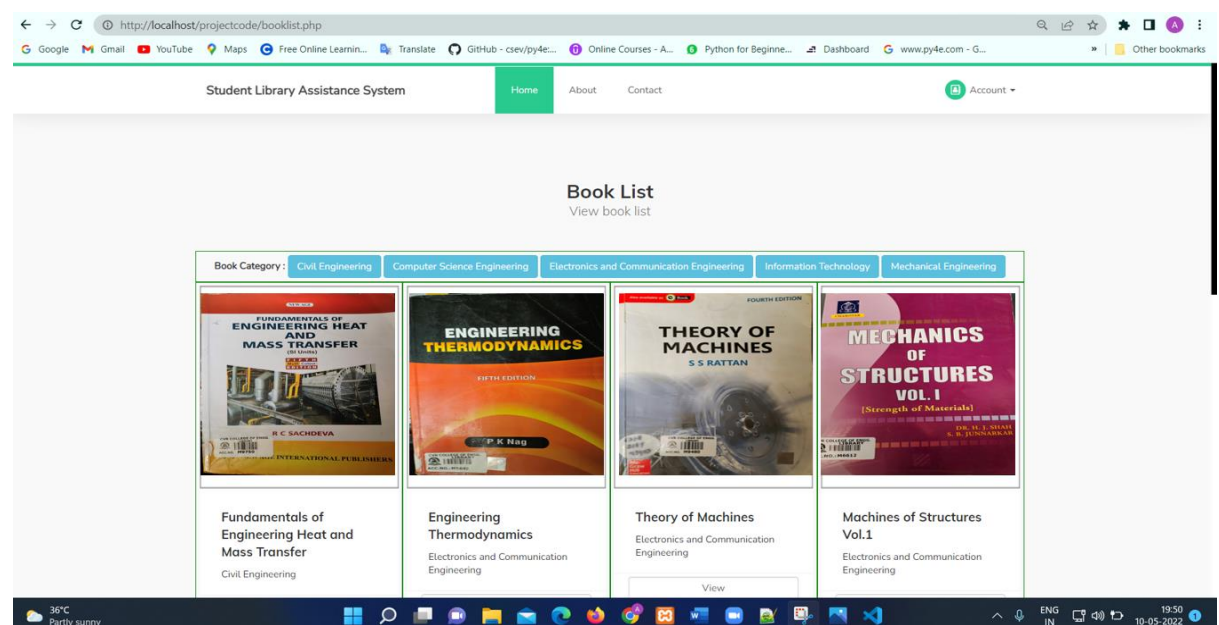


Figure 6.5: Book Categories

### 6.1.4.2 View Book

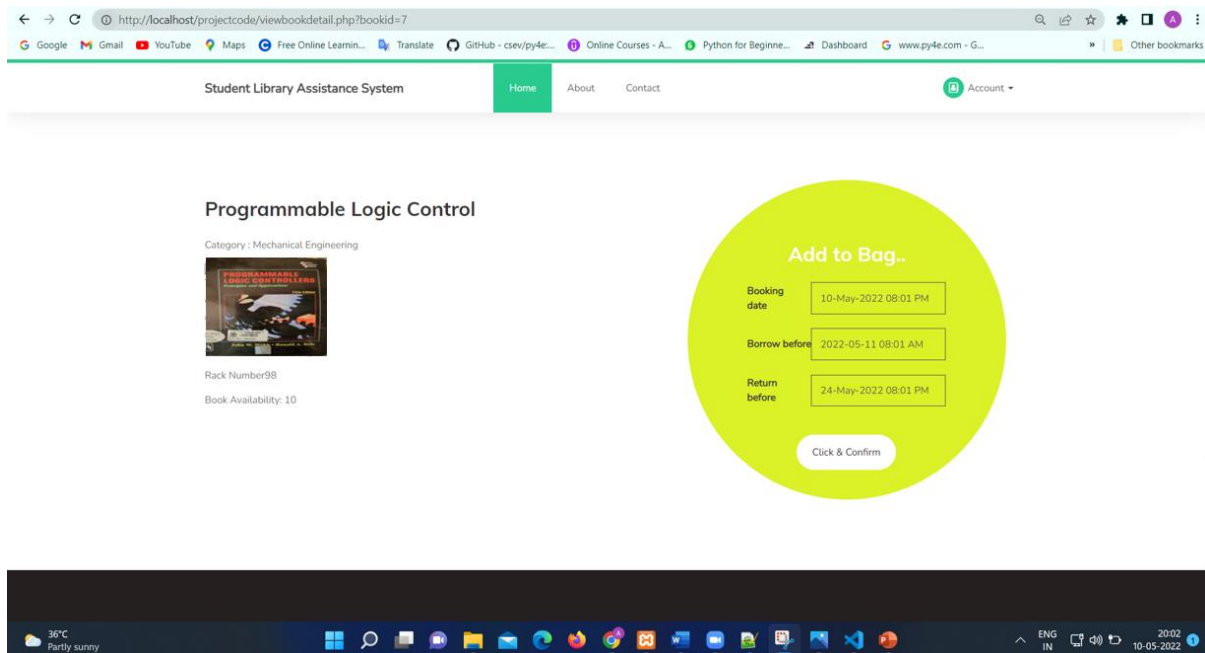


Figure 6.6: Book details along with pre-order

Figure 6.6 displays the book details such as category, rack number, and the available stock of the book which is selected. Along with the book details we get to add the book to the cart/bag which shows Booking date, Borrow Date and Return Date then Click & Confirm.

### 6.1.4.3 Request Number

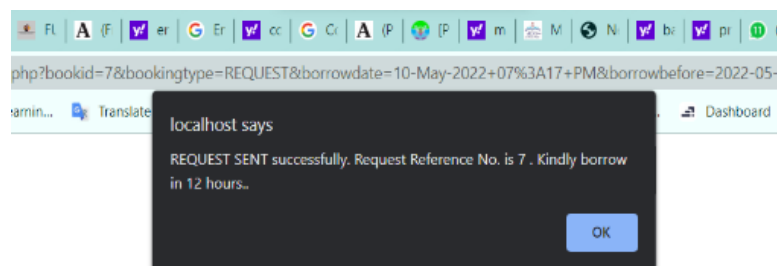


Figure 6.7: Request Number



### 6.1.4.4 View Request

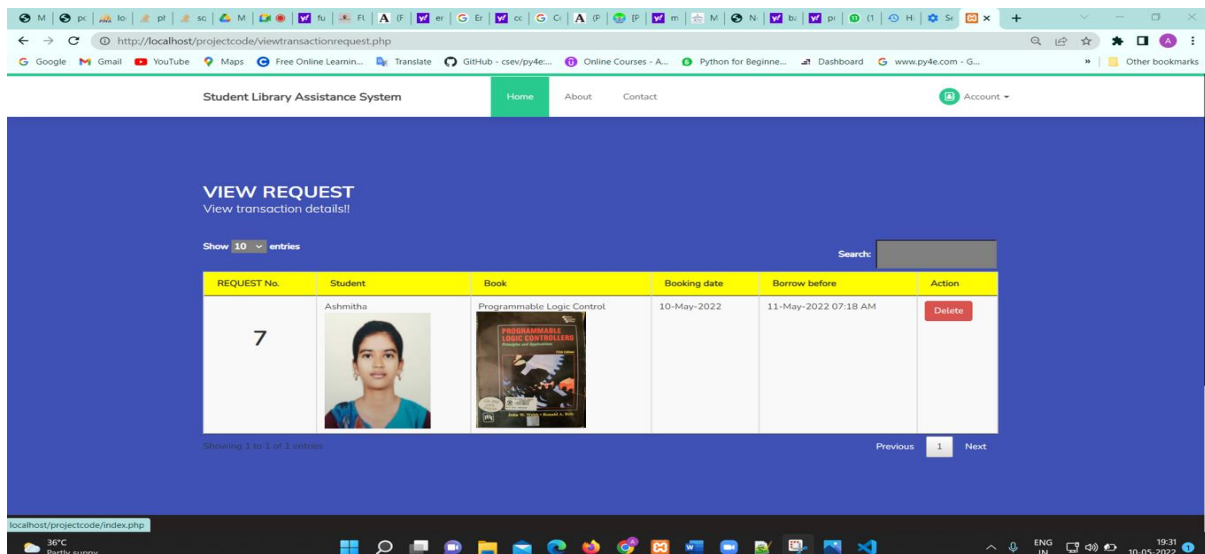


Figure 6.8: View Book Request

### 6.1.5 Admin/Librarian Dashboard

Admin/Librarian can view Book records, Book Category records, Book stock records, Branch details, course details, fines, etc.

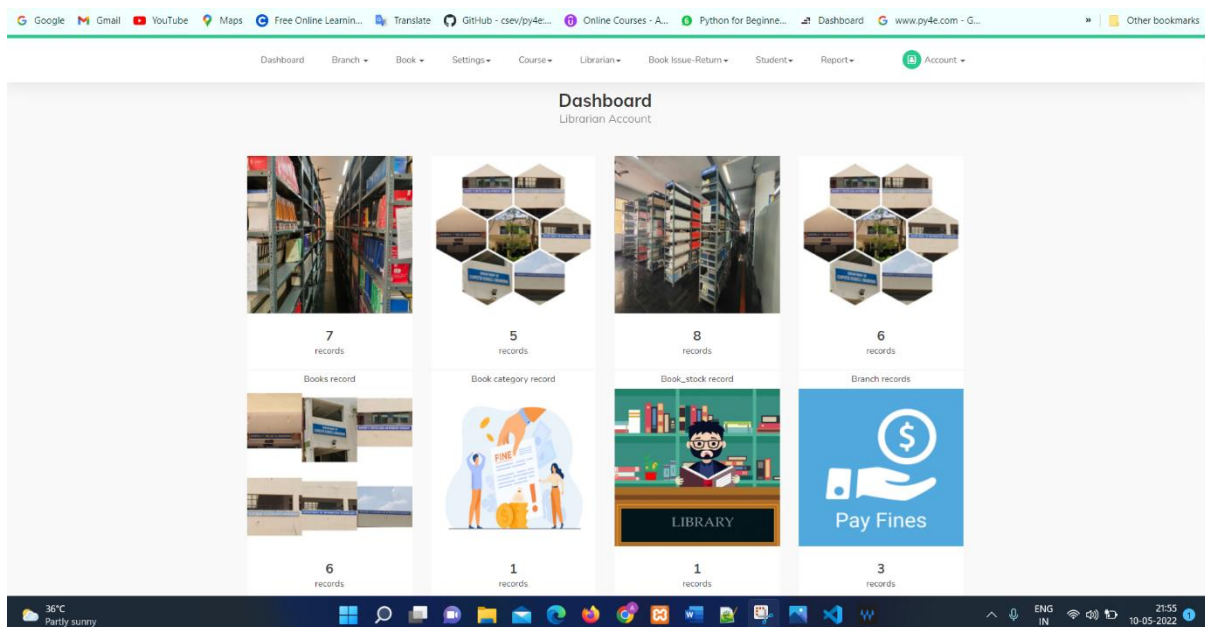


Figure 6.9: Admin Dashboard

## 6.1.6 Student Records

Admin can view the list of students and their details.

Student  
View student details!!

Show 10 entries

Search:

Image	Course	StudentName	Rollno	Email ID	Contactno	Status	Action
	ECE	Ashmitha	18881A0404	ashmitha@gmail.com	784512555	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	CSE	Sai Preeth	18881A0404	saipreeth@gmail.com	8698563212	Active	<a href="#">Edit</a> <a href="#">Delete</a>

Showing 1 to 2 of 2 entries

Previous 1 Next

Address: CVR College Of Engineering, Mangalpalli  
Contact info: 1800123456, 1800222222  
Copyright © 2022 Student Library Assistance System

Figure 6.10: Student Records

## 6.1.7 View Book Details

Book  
View book details!!

Show 10 entries

Search:

Book image	Book name	rack Number	Book Stock	Status	Action
	Fundamentals of Engineering Heat and Mass Transfer [Category: Civil Engineering] [Author: RC SACHDEV]	127	Total Qty: 16 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Engineering Thermodynamics [Category: Mechanical Engineering] [Author: PK NAG]	184	Total Qty: 3 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Theory of Machines [Category: Mechanical Engineering] [Author: SS RATTAN]	250	Total Qty: 0 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Mechanics of Structures Vol.1 [Category: Mechanical Engineering] [Author: Dr. H. J. SHAH]	212	Total Qty: 0 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Construction Planning, Equipments and Methods [Category: Civil Engineering] [Author: Purnifoy Schenayder Shap]	200	Total Qty: 55 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Basic Structural Analysis [Category: Civil Engineering] [Author: C.S. REDDY]	450	Total Qty: 25 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>
	Programmable Logic Control [Category: Electronics and Communication Engineering]	98	Total Qty: 10 <a href="#">Add Stock</a> <a href="#">View Stock</a>	Active	<a href="#">Edit</a> <a href="#">Delete</a>

Figure 6.11: Book Details

## 6.1.8 Fine Settings

**Fine setting**  
Enter fine details!

Days to keep:  
14

Penalty / Day:  
2.00

No. of books for student:  
3

submit

Address Contact Info Copyright © 2022 Student Library Assistance System

36°C Partly sunny 11-05-2022 09:51

Figure 6.12: Fine Settings

## 6.1.9 MySQL Database

phpMyAdmin

Database: library\_automation\_desk

Table Action Rows Type Collation Size Overhead

book	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16.0 K	18
bookcategory	Browse Structure Search Insert Empty Drop	5	InnoDB	latin1_swedish_ci	16.0 K	18
bookstock	Browse Structure Search Insert Empty Drop	9	InnoDB	latin1_swedish_ci	16.0 K	18
branch	Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	16.0 K	18
course	Browse Structure Search Insert Empty Drop	6	InnoDB	latin1_swedish_ci	16.0 K	18
finesettings	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16.0 K	18
librarian	Browse Structure Search Insert Empty Drop	1	InnoDB	latin1_swedish_ci	16.0 K	18
penalty	Browse Structure Search Insert Empty Drop	9	InnoDB	latin1_swedish_ci	16.0 K	18
student	Browse Structure Search Insert Empty Drop	2	InnoDB	latin1_swedish_ci	16.0 K	18
transaction	Browse Structure Search Insert Empty Drop	7	InnoDB	latin1_swedish_ci	16.0 K	18
10 tables	Sum	47	InnoDB	utf8mb4_general_ci	160.0 K	0

10 tables Sum 47 InnoDB utf8mb4\_general\_ci 160.0 K 0

Create table

Name: Number of columns: 4

Go

Figure 6.13: Database

## 6.2 Hardware

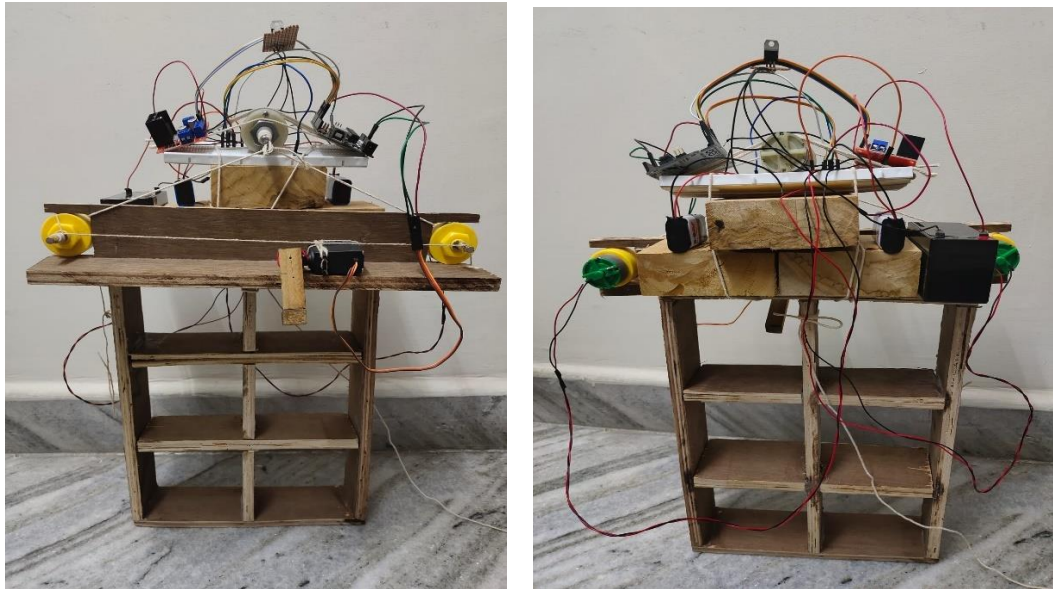


Figure 6.14 Hardware

Input is taken from the user and is given to the Arduino UNO. Depending on the received instructions the motor driver takes signals from Arduino, controls Servo and DC Motors by moving the wooden part to a particular rack. The two switches are used to determine the Rack number in which the book is placed and the Servo Motor tries to push the book. The third switch is used to check whether the book has fallen down and the whole system gets reset.

## Conclusion and Future Scope

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### 7.1 Conclusion

The availability of new technology has enabled automation of nearly all services provided in any facet of life. The library is not an exception to this great idea; hence it comes with a good number of advantages when all the activities that take place in it are automated. New jobs will always be created as a result of automation. Staff will always be motivated to work with new automated systems, since a lot of paper work is eliminated, and functions and services are concentrated just within the power of a mouse click and input of data into the system. Costs are incurred only once; when buying the system, and training personnel.

Both Admin and student can access the page using unique id and passwords. Admin login is controlled by the person who takes care of the library. It helps the admin to update the books list, check the availability of preferred books by students, able to keep a note of fines pending and dues to be paid by the students and finally keep a track of borrowed and available books.

In the same way student login id is used to check the availability of his or her preferred books it may be related to technology subject or non tech, check the quantity of books available and the books present for his or her priority. And it makes easier for student by displaying the rack number of the book they choose to pick and quantity of books available for book they choose. In this way it is easier to both admin as well as student to distinguish books that they want and admin to keep a track on student as well as books simultaneously.

Student can also borrow books beforehand by requesting, after librarian approval a hardware robot takes book from rack given the information about the respective book rack from librarian. This reduces librarian workload during their busy work hours.

Our work was an attempt to develop a web application along with library robot for student and librarian assistance.

## **7.2 Future Scope**

The main scope of this project is in future we use this software on smaller interfaces such as mobile phones that runs on androids or iOS. We can also include a portable library where students need not to visit library instead can access it from remote area whenever user wants to access it. Facility to cancel to reservation for a book made earlier.

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