

# **PROJECT**

## **SMART LIBRARY SHELF MANAGEMENT SYSTEM**

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for partial fulfillment of the requirements

for the Degree of Bachelor of Computer Applications

B.V. Patel Institute of Business Management ,

Computer & Information Technology,

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June, 2020.



Team No : B14

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# CERTIFICATE

This is to certify that the project entitled **Smart Library Shelf Management(Using RFID)** is submitted by **Vallecha Amit H. (201703100110072), Solanki Akhilesh Kumar K. (201703100110074), Modi Mrugesh R. ( 201703100110080 ) and Jinwala Maaz M. ( 201703100110092 )** for 6<sup>th</sup> semester as a partial fulfillment for the requirement of the degree of Bachelor of Computer Application during the academic year 2019-2020.

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# **DECLARATION**

We hereby declare that the project titled SMART LIBRARY SHELF MANAGEMENT SYSTEM is fully implemented by us. It is neither paid nor copied. Even though, later on, in case of any infringement found for this project work, we are solely responsible for the same and understand that as per UGC norms, the University can revoke the degree conferred to us.

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As a guide, I assure that there is no plagiarism found in submitted document.

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## **ACKNOWLEDGEMENT**

This document is a representation of the proposed system and could only be made possible by the co-operation of all the team members. All the team members have provided their valuable inputs and completed their respective works. The team had lots of help from our project guide and course teacher Mr. Pratik B. Nayak without whom this task seemed to be nearly impossible. We wholeheartedly thank Mr. Pratik B. Nayak for guiding us and correcting us wherever required. This task would not have been possible without the help and support of our prestigious institute B. V. Patel Institute of Business Management, Computer & Information Technology and our UKA TARSADIA UNIVERSITY which provided us with the platform and opportunity for undertaking this rich learning experience.

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# Chapter-1 Introduction of Project

## 1.1 System outline

The library is an important part of the academic sector as well as most of the professional sectors. The efficiency of a library lies in how the books are arranged and how easily one can get the books of their choice. This Smart Library Shelf Management system supports the general requirements of the librarian and the student as well as offers flexible and convenient features. This system allows librarians and library users to minimize time and maximize the efficiency of the library. This system gives the exact search result of the book as well as the exact location of the book to the user.

It will manage the information about the shelves, books, faculties, and students. It will also provide information regarding the misplaced book on the shelf by the book reader. It will generate the different reports for the administrator and librarians also, this system is customizable for any new library requirements.

## 1.2 Purpose

- To manage book, slot and shelf detail.
- To get the location of a book as per the search query of reader.
- Configure and reschedule of book location, if the new shelf is purchased in the library.
- The graphical representation of the book location.
- Reports on a number of the book in an unordered state.

## 1.3 Scope

- The scope of the proposed system is limited to the academic institution which will provide an efficient way to systematize the book on shelves as well as it determine the disorganized books. The System will also administer the information of its users.

## 1.4 Tools and Technology

### ➤ Hardware

- Arduino UNO R3: - Open source electronics prototyping platform

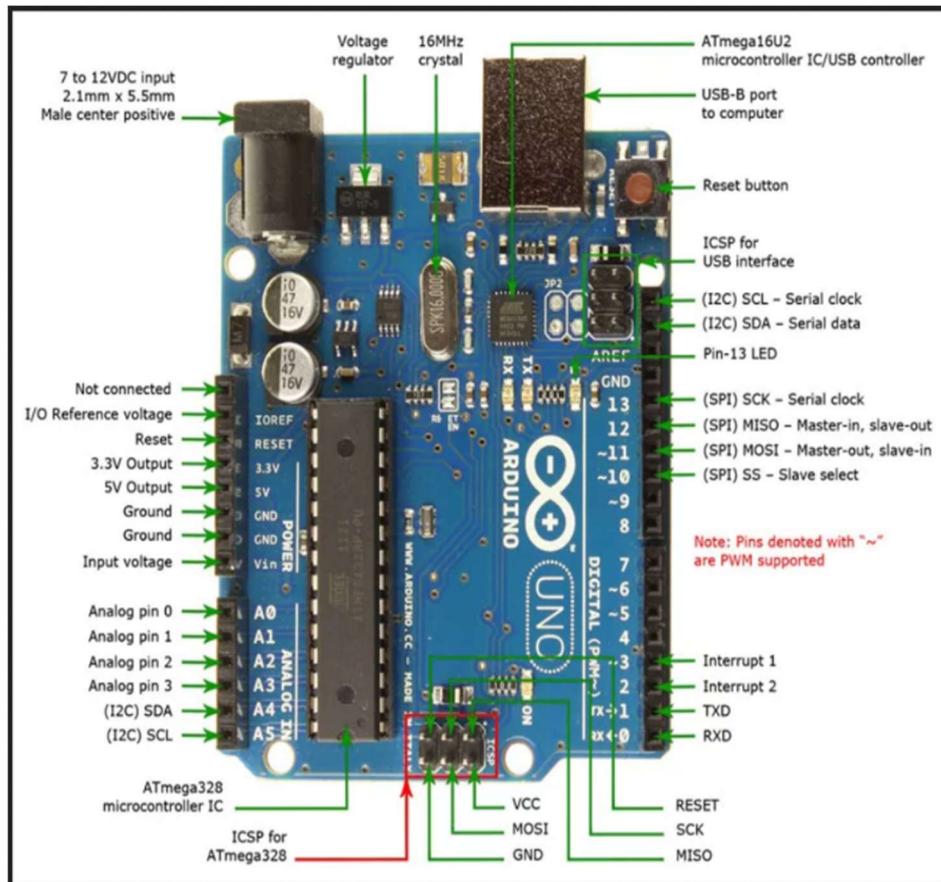


Figure 1.1 Diagram of Arduino UNO [1]

- The Arduino Uno board is a microcontroller based on the ATmega328. It has
  - 14 digital input/output pins in which 6 can be used as PWM outputs,
  - a 16 MHz ceramic resonator,
  - an ICSP header,
  - a USB connection,
  - 6 analog inputs,
  - a power jack and a reset button.
- This contains all the required support needed for microcontroller. In order to get started, they are simply connected to a computer with a USB cable or with an AC-to-DC adapter or battery.

## Smart Library Shelf Management System

- Arduino Uno Board varies from all other boards and they will not use the FTDI USB-to-serial driver chip in them. It is featured by the Atmega16U2 (Atmega8U2 up to version R2) programmed as a USB-to-serial converter. [2]
- NodeMCU-ESP8266

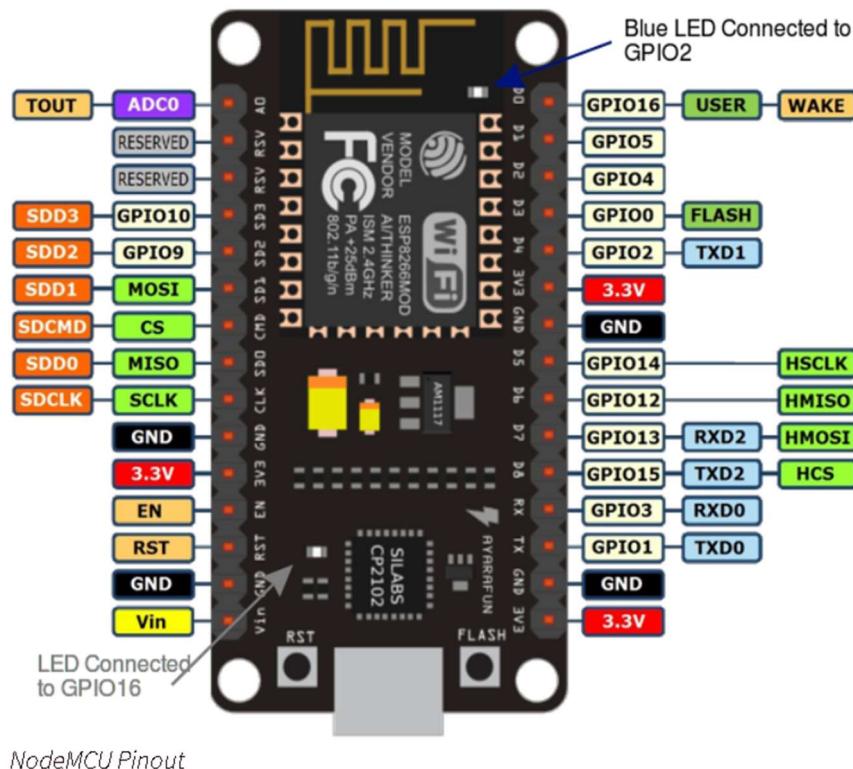


Figure 1.2 Diagram of NodeMCU [3]

- An open-source firmware and development kit that helps you to prototype your IoT product within a few Lua script lines.
- NodeMCU is an open source IoT platform. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif Systems, and hardware which is based on the ESP-12 module. The term "NodeMCU" by default refers to the firmware rather than the dev kits. The firmware uses the Lua scripting language. It is based on the eLua project and built on the Espressif Non-OS SDK for ESP8266.
  - Built-in on-board USB-TTL serial converter based on CH340G, with Micro-USB socket

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- Power in for DC 4~9V DC to pin VIN
- Pin headers 2.54mm (0.1") 15 pins x 2 rows
- Arduino-like hardware I/O and can program in Arduino IDE
- Event-driven API for network applications
- 10 GPIOs D0-D10, PWM functionality, IIC and SPI communication, 1-Wire and ADC A0 etc. all in one board
- Wi-Fi networking (can be used as an access point and/or station, host a web server), connect to the internet to fetch or upload data
- The board combines features of WiFi access point and station plus microcontroller and uses simple Lua based programming language.<sup>[4]</sup>
- Bread-Board

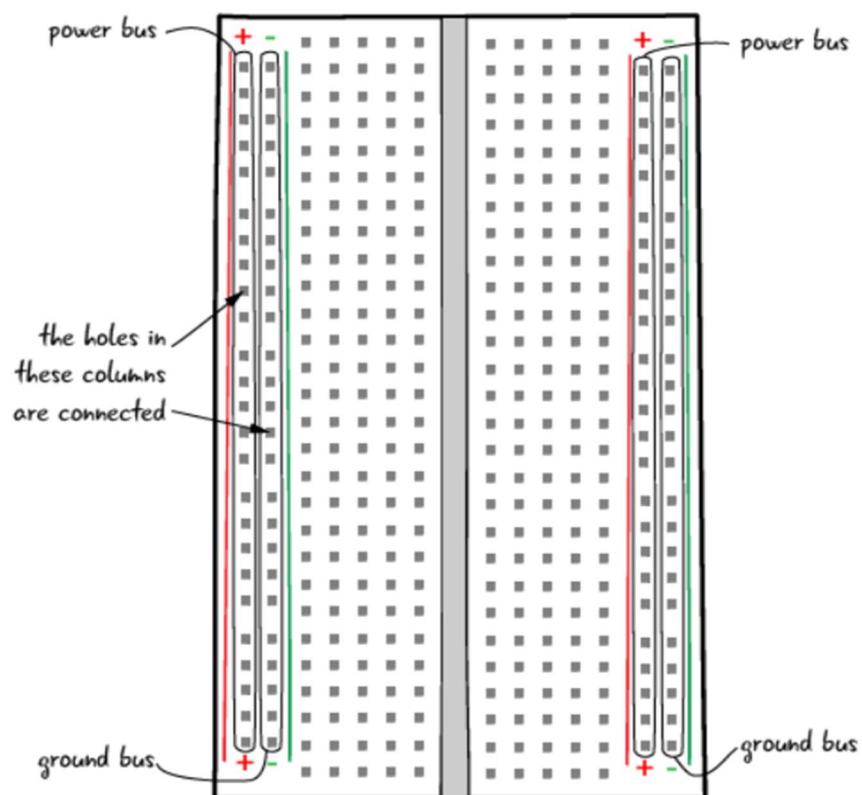


Figure 1.3 Diagram of Bread-Board [5]

- A thin plastic board used to hold electronic components (transistors, resistors, chips, etc.) that are wired together. Used to develop prototypes of electronic circuits.

## Smart Library Shelf Management System

- The breadboard contains spring clip contacts typically arranged in matrices with certain blocks of clips already wired together. The components and jump wires (assorted wire lengths with pins at both ends) are plugged into the clips to create the circuit patterns.
- The boards also typically include metal strips along the side that are used for common power rails and signal buses. [6]
- Servo-SG90 micro Motor
  - A servo motor is a rotary actuator or a motor that allows for a precise control in terms of the angular position, acceleration, and velocity. Basically, it has certain capabilities that a regular motor does not have. Consequently, it makes use of a regular motor and pairs it with a sensor for position feedback. [7]



Figure 1.4 Diagram of continuous rotation servo motor.[7]

- Jumpers (Male to Male, Male to Female)
  - Jumper wires are simply wire that have connector pins at each end, allowing them to be used to connect two points to each other without soldering.[8]

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Figure 1.5 Male to Male [8]

Figure 1.6 Male to Female [9]

- RFID-RC522 reader & tag

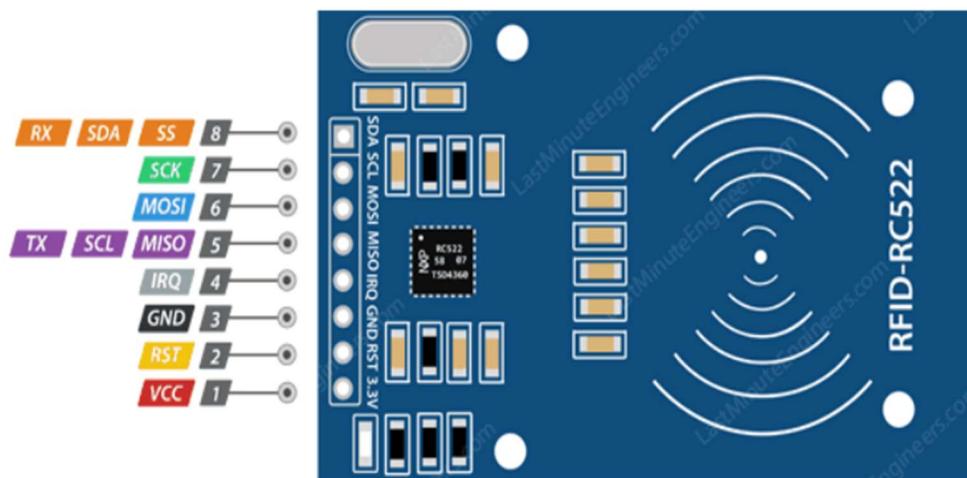


Figure 1.7 Diagram of RFID-RC522[10]

- A radio frequency identification reader (RFID reader) is a device used to gather information from an RFID tag, which is used to track individual objects. Radio waves are used to transfer data from the tag to a reader. [11]
- The RC522 RFID Reader module is designed to create a 13.56MHz electromagnetic field that it uses to communicate with the RFID tags (ISO 14443A standard tags). The reader can communicate with a microcontroller over a 4-pin Serial Peripheral Interface (SPI) with a maximum data rate of 10Mbps. It also supports communication over I2C and UART protocols. [12]

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### ➤ Software

- NetBeans 8.2 IDE with JDK version 10.[<sup>13</sup>]
- Glassfish Server version 4.1.1 open-source application server (Release October 7,2015).[<sup>14</sup>]
- HTML-5.3 (Hyper Text Markup Language) (Release October 18,2018). [<sup>15</sup>]
- CSS-3(Cascading Style Sheet) (Release December 17,2016). [<sup>16</sup>]
- Bootstrap-4.0 (Release January 18,2018). [<sup>17</sup>]
- JavaScript 5.1
- J-Query 3.4.1
- MYSQL 8.0.19 (release January 13,2020). [<sup>18</sup>]
- Firebase Realtime database for web application
  - JavaScript CDN version- 7.10.0 (March 5,2020). [<sup>19</sup>]
- Arduino Desktop IDE 1.8.12 (Release February 13,2020). [<sup>20</sup>]

### 1.5 Functionalities

#### 1.5.1 Expected Requirement

- One-time Registration
  - The system shall able to provide one-time registration to the new members.
- Login
  - The system shall able to provide to the existing users.
- Manage Floor Information
  - The system shall able to provide CRUD operations for managing floor information.
- Managing Shelf Information
  - The system shall able to provide CRUD operations for managing shelf information.
- Manage RFID Reader & RFID Tags
  - The system shall be able to generate a unique ID for the RFID tag.
  - The system shall be able to read information from an RFID reader.
- Manage Institute & Course Information
  - The system shall able to provide CRUD operations for managing Institute & Course information.
- Manage User Information
  - The System shall able to provide managing all user information.
- Manage Book Information
  - The system shall able to provide CRUD operations for managing book information.
- Search Book
  - A member of the library shall be able to search for books based on ISBN, titles, author name.

## Smart Library Shelf Management System

### ➤ Generating Reports

- Statistical Reports of Total No of Floor, Shelf, Reader, configured book, Institute & course.
- Statistical Reports of registered students, faculty.
- Graphical represent of Misplaced Book & Searched Book.

### 1.5.2 Exciting Requirement

#### ➤ Misplaced books

- Librarians shall be able to get report for the misplaced books.

#### ➤ Graphical Representation of Location

- The system shall able to provide the graphical interface to display the actual location of the shelf and the books.

## 1.6 User Characteristics

### 1.6.1 System Administrator

- The administrator shall be able to login using credentials.
- The administrator shall be able to manage information of floor, shelves and all the other users of library.
- The administrator shall be able to generate reports (Total Generated RFID tags, Total shelves configured on each floor).

### 1.6.2 Librarian

- The Librarian shall be able to login using credentials.
- The Librarian shall be able to manage information about books. (CRUD operation).
- The Librarian shall be able to view graphical representation of misplaced books.
- The Librarian shall be able to generate reports.

### 1.6.3 Members (Student & Faculty)

- The Members shall be able to login using credentials.
- The Members shall be able to register the very first time.
- The Members shall be able to search books based on search criteria (ISBN, Title, Author, publication).
- The Members shall be able to view the actual location of the shelf as well as the book.

## 1.7 Data Dictionary, integrity constraints

### 1.7.1 Table Name: - tbl\_instituteinfo\_master\_slsms

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
institute_id	CHAR	4	Primary Key, Not Null	I101, I102	This represents the unique identification number of institutes.	
institute_name	VARCHAR	256	Not null	B.V. Patel Institute of BMC & I.T.	This represents the name of the institutes.	

Table 1.1 tbl\_instituteinfo\_master\_slsms

## Smart Library Shelf Management System

### 1.7.2 Table Name: - **tbl\_coursedetails\_slsms**

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
course_id	CHAR	4	Primary Key, Not Null	C101, C102	This represents the unique identification number of courses.	
institute_id	CHAR	4	Foreign Key, Not null	I101, I102	This represents the unique identification number of institutes.	tbl_instituteinfo_master_slsms
course_name	VARCHAR	256	Not null	Bachelor of Computer Application	This represents the Course name	

Table 1.2 **tbl\_coursedetails\_slsms**

## Smart Library Shelf Management System

### 1.7.3 tbl\_nativeuserinfo\_master\_slsms

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
name	VARCHAR	50	Not Null	Mrugesh, Akhilesh	This represent the name of the native user	
username	VARCHAR	256	Primary Key, Not Null	Admin_@12	This represent unique username of the admin & librarian	
pass	TINYTEXT	256	Not Null	Admin@123	This represent the password.	
u_role	VARCHAR	13	Not Null	Administrator, Librarian	This represent the role of user.	
email_id	VARCHAR	256	UNIQUE KEY	xyz@gmail.com	This represent the email id of the user where he/she can get there autogenerate password.	
last_login	TIMESTAMP	7		2020-05-25 12:45:50	This represent the last login	

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					timestamp of the user	
last_logout	TIMESTAMP	7		2020-05-25 12:45:50	This represent the last logout timestamp of user	
status	BIT	0.125		0 or 1	This represent status of the user whether its active or blocked.	

table 1.3 tbl\_nativeuserinfo\_master\_slsms

### 1.7.4 Table Name: - **tbl\_studentinfo\_master\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
enrollment_no	CHAR	15	Primary Key, Not Null	201703100110080	This represents the unique identification number of Students.	
course_id	CHAR	4	Not null	C101, C102	This represents in which course	tbl_coursedetails_slsms

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						student is enroll.	
student_name	VARCHAR	256	Not Null	Akhilesh Solanki	K.	This represents name of student.	
student_birthdate	DATE	3	Not Null	04/08/1999		This represents the birthdate of the Student.	
student_password	VARCHAR	10	Not Null	abcd@072		This represent the password of student. The length of the password must be a minimum 8 character and a maximum of 10 characters. The password	

## Smart Library Shelf Management System

					must contain a combination of alphanumeric and at least one special character.	
--	--	--	--	--	--	--

Table 1.4 tbl\_studentinfo\_master\_slsms

### 1.7.5 Table Name: - **tbl\_studentregistered\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
enrollment_no	CHAR	15	Primary Key, Not Null, Foreign Key	20170310011008	This represents the unique identification number of Students.	tbl_studentinfo_master_slsms
student_email	VARCHAR	256		<a href="mailto:mrugeshmodi.mm@gmail.com">mrugeshmodi.mm@gmail.com</a>	This represents the email address of Students.	

## Smart Library Shelf Management System

student_phone_number	CHAR	14		+919099075613	This represents the Contact number of Student	
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Table 1.5 tbl\_studentregistered\_slsms

### 1.7.6 Table Name: - **tbl\_facultyinfo\_master\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
enrollment_no	VARCHAR	256	Primary Key, Not Null	<a href="mailto:abc@utc.a.c.in">abc@utc.a.c.in</a>	This represents the unique identification of Faculty.	
course_id	CHAR	4	Not null	C101.C102	This represents in which course student is enroll.	tbl_coursedetails_slsms
faculty_name	VARCHAR	256	Not Null	Jignesh Modi	This represents the name of the Student.	

## Smart Library Shelf Management System

faculty_birthdate	DATE	3	Not Null	20/12/19 86	This represents the birthdate of Faculty	
faculty_password	VARCHAR	20	Not Null	abcd@123	<p>This represents the password of Faculty.</p> <p>The length of the password must be a minimum 8 characters long and a maximum length size of 10 characters.</p> <p>The password must contain a combination of the alphanumeric and at least one</p>	

## Smart Library Shelf Management System

					special character.	
--	--	--	--	--	--------------------	--

Table 1.6 tbl\_facultyinfo\_master\_slsms

### 1.7.7 Table Name: - **tbl\_facultyregistered\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
enrollment_no	VARCHAR AR	256	Primary Key, Not Null, On Delete Cascade, On Update Cascade	<a href="mailto:abc@utc.ac.in">abc@utc.ac.in</a>	This represents the unique identification of Faculty.	tbl_facultyinfo_master_slsms
faculty_email	VARCHAR AR	256		<a href="mailto:abc@gmail.com">abc@gmail.com</a>	This represents email of Faculty.	
faculty_phone_number	CHAR	14		+919099075613	This represents the Contact No number of the Faculty.	

Table 1.7 tbl\_facultyregistered\_slsms

## Smart Library Shelf Management System

### 1.7.8 Table Name: - tbl\_shelfmainsection\_master\_slsms

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes )</b>	<b>Constraint s</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
main_section_id	TINYINT	1	Primary Key, Not Null	1,2	This represents the unique identification of main section.	
main_section_type	VARCHAR	256		Fiction , Non-fiction	This represents the type of the section.	

Table 1.8 tbl\_shelfmainsection\_master\_slsms

## Smart Library Shelf Management System

### 1.7.9 Table Name: - **tbl\_shelfsubsection\_slsms**

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
sub_section_id	TINYINT	1	Primary Key, Not Null	1,2	This represents the unique identification of main section.	
main_section_id	TINYINT	1	Foreign Key, On Delete Cascade , On Update Cascade	1,2	This represent main section id for the sub section.	tbl_shelfmainsection_master_slsms
sub_section_type	VARCHAR	256		Programming, literature	This represents the type of the sub section.	

Table 1.9 **tbl\_shelfsubsection\_slsms**

## Smart Library Shelf Management System

### 1.7.10 Table Name: - tbl\_floorinfo\_master\_slsms

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
floor_id	TINYINT NT	1	Primary Key, Not Null	1,2	This represents the unique identification of Floor.	
max_allowed_shelves	TINYINT NT	1		1,9, 10	This represents the maximum number of allowed shelves in particular floor.	
main_section_id	TINYINT NT	1	Foreign Key, Not Null, on delete cascade,		This represents the section	tbl_shelfmainsection_master_slsms

## Smart Library Shelf Management System

			On update cascade		of the floor	
--	--	--	-------------------	--	--------------	--

Table 1.10 tbl\_floorinfo\_master\_slsms

### 1.7.11 Table Name: - tbl\_categorywise\_arrangement\_onfloor\_slsms

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
floor_id	TINYINT	1	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	1,2	This represents the unique identification of floor.	tbl_floorinfo_master_slsms
sub_section_id	TINYINT	1	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	1,2,3	This represents the identification of the sub section.	tbl_shelfsubsection_slsms
No_of_allowed_shelves	TINYINT	1		1,2,5, 8,9	This represents number of shelves	

## Smart Library Shelf Management System

					allowed on particula r shelf.	
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Table 1.11 tbl\_categorywise\_arrangement\_onfloor\_slsms

### 1.7.12 Table Name: - **tbl\_shelfinfo\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
shelf_id	CHAR	4	Primary Key, Not Null	S101, S102	This represents the unique identification of shelf.	
no_of_tiers	TINYINT	1		1,2,3	This represents the number of tiers in the shelf	
floor_id	TINYINT	1	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	1,2,3	This represent ID of shelf on which shelf is to be configured	tbl_floorinfo_master_slsms

## Smart Library Shelf Management System

sub_section_id	TINYINT	1	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	1,2,3	This represent the sub section in which shelf is to be placed	tbl_shelfsubsection_slsms
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Table 1.12 tbl\_shelfinfo\_slsms

### 1.7.13 Table Name: - `tbl_shelftierconfiguration_slsms`

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
shelf_id	CHAR	4	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	S101, S102	This represents the unique identification of Shelf.	tbl_shelfinfo_slsms
shelf_tier_id	VARCHAR	6	Primary Key, Not Null	S101_1, S102_1	This represents the identification of individual tier on shelf.	

## Smart Library Shelf Management System

book_lib_id	VARCHAR	4		B101	This represent the identification of book in the library	
max_allowed_book	TINYINT	1		10,20,30	This represents number of books allowed to be placed on each tier	
present_book	TINYINT	1		30,20	This represent the number of books on the shelf tier	
start_bookid_range	VARCHAR	5		B1101	This represent the start book id of the book.	
end_bookid_range	VARCHAR	5		B1130	This represent the end	

## Smart Library Shelf Management System

					book id of the book.	
rfid_reader_Id	VARCHAR	10		Reader_1	This represent the RFID Unique number placed on that shelf's tier.	

Table 1.13 tbl\_shelftierconfiguration\_slsms

### 1.7.14 Table Name: - **tbl\_bookinfo\_master\_slsms**

Field Name	Data Type	Size (bytes)	Constraints	Valid values input	Description of the field	Linkage with other tables
Book_lib_id	VARCHAR	4	Primary Key, Not Null	B1, B2	This represents the unique identification of Book Category.	
book_sub_section_id	TINYINT	1	Primary Key, Foreign Key, Not Null	1,2,3	This represents the type of	tbl_shelfsubsektion_slsms

## Smart Library Shelf Management System

					book category.	
book_title	VARCHAR	256		Java Complete References	This represents the title of book.	
book_author	VARCHAR	256		Herbert Schildt	This represents the author of the book	
book_publication	VARCHAR	256		McGraw Hill Education; Tenth edition (1 November 2017)	This represents publication of the book.	
book_ISBN_13	CHAR	17		978-9387-432-29-1	This represents International standard book number category -13 of the book	

## Smart Library Shelf Management System

book_language	VARCHAR	20		Hindi, English	This represents language of the book.	
book_paperback	SMALLINT	2		1296	This represents total number of pages available in the book.	
book_dimension	VARCHAR	25		23.49*2.49*23.48	This represents the length, breadth, height of the book	
userinfo	VARCHAR	256		librarian_lib1@utu.ac.in	This represents which user insert or update the book.	

Table 1.14 tbl\_bookinfo\_master\_slsms

## Smart Library Shelf Management System

### 1.7.15 Table Name: - **tbl\_bookconfiguration\_slsms**

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
book_lib_id	VARCHAR	4	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	B101, B102	This represents the unique identification of book in library.	tbl_bookinfo_master_slsms
Book_id	VARCHAR	5	Primary Key, Not Null	B101_1	This represents the individual Identification of the book in library.	

Table 1.15 **tbl\_bookconfiguration\_slsms**

## Smart Library Shelf Management System

### 1.7.16 Table Name: - tbl\_extraallbookslots\_slsms

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
book_lib_id	VARCHAR	4	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	B101, B102	This represents the unique identification of book in library.	tbl_bookinfo_master_slsms
book_quantity	SMALLINT	2		100,200	This represents the total number of quantities	
start_bookid_range	VARCHAR	5			This represents the start book id of the book.	
end_bookid_range	VARCHAR	5			This represents the end book id of the book.	

Table 1.16 tbl\_extraallbookslots\_slsms

## Smart Library Shelf Management System

### 1.7.17 Table Name: - tbl\_notassignedbookslots\_slsms

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
book_lib_id	VARCHAR	4	Foreign Key, Not Null, On Delete Cascade, On Update Cascade	B101, B102	This represents the unique identification of book in library.	tbl_bookinfo_master_slsms
book_quantity	SMALLINT	2		100,200	This represents the total number of quantities	
start_bookid_range	VARCHAR	5		B1001	This represents the start book id of the book.	
end_bookid_range	VARCHAR	5		B1090	This represents the end book id of the book.	

Table 1.17 tbl\_notassignedbookslots\_slsms

## Smart Library Shelf Management System

### 1.7.18 Table Name: - tbl\_rfid\_reader\_configuration\_slsms

Field Name	Data Type	Size (bytes)	Constraints	Valid input values	Description of the field	Linkage with other tables
rfid_reader_uid	VARCHAR	10	Primary Key, Not Null	Reader_1	This represent the unique id of the reader.	
universal_product_code	BIGINT	20	Not Null, Unique Key	90887654 678	This represent the universal product number of the reader.	

Table 1.18 tbl\_rfid\_reader\_configuration\_slsms

## Smart Library Shelf Management System

### 1.7.19 Table Name: - **tbl\_allfloor\_misplacedbookdata\_slsms**

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
Sr.no	Int	4	Primary Key, Not Null	1,2	This represent the serial number of fields.	
floorid	TINYINT	1	Primary Key, Not Null	1,2	This represent the floor no.	tbl_floorinfo_master_slsms
shelf_id	VARCHAR	4	Primary Key, Not Null	S101, S102	This represent the shelf id.	
Shelf_tier_id	VARCHAR	6	Primary Key, Not Null	S101_1	This represent the shelf tier id.	
bookid	VARCHAR	4	Primary Key, Not Null	B1001	This represent the book id.	tbl_bookinfo_master_slsms
Timestamp	TIMESTAMP	7	Primary Key, Not Null	2020-01-01 12:22:30	This represent the DateTime	

Table 1.19 **tbl\_allfloor\_misplacedbookdata\_slsms**

## Smart Library Shelf Management System

### 1.7.20 Table Name: - **tbl\_configuredbookreport\_slsms**

<b>Field Name</b>	<b>Data Type</b>	<b>Size (bytes)</b>	<b>Constraints</b>	<b>Valid input values</b>	<b>Description of the field</b>	<b>Linkage with other tables</b>
Bookid	VARCHAR	4	Primary Key, Not Null	B1001	This represent the book id.	tbl_bookinfo_master_slsms
Timestamp	DATETIME	8		2020-02-01 12:10:45	This represent the date and time.	
flag	TINYINT	1		1,2	This represent the newly configured book.	

Table 1.20 **tbl\_configuredbookreport\_slsms**

## **1.8 Summary**

<b>Sr. No</b>	<b>Expected Functionalities</b>	<b>Exciting Functionalities</b>
1.	Login with User Credentials for Admin, Librarian, Members	-
2.	Member Registrations (Student/Faculty).	-
3.	Managing Floor Information	-
4.	Managing Shelf Information	Automatic assignment of reader to the shelf. Automatic assignment of number of quantity book on shelves based on their dimensions.
5.	Managing Book Information	Automatic assignment of shelf and floor based on category of book. If shelves are not there books are assigned in the warehouse.
6.	Managing Reader Information	Automatic assignment of reader to the shelf. Real-time tracking of shelves data using RFID reader and Firebase Cloud.
7.	Managing Course and Institute Information	-
8.	Manage User Information	-

## Smart Library Shelf Management System

9.	Manage Search Book Functionality	Graphical representation of book. (Provide Map of library.)
10.	Generation of reports for Admin, Librarian	Graphical representation of the misplaced book.
<b>Count</b>	10	8
<b>Total Functionalities</b>	18	

Table 1.21 Summary table for all functionality

## Chapter 2 GUI Design

### 2.1 Traversals

#### 2.1.1 Entry Point Traversals

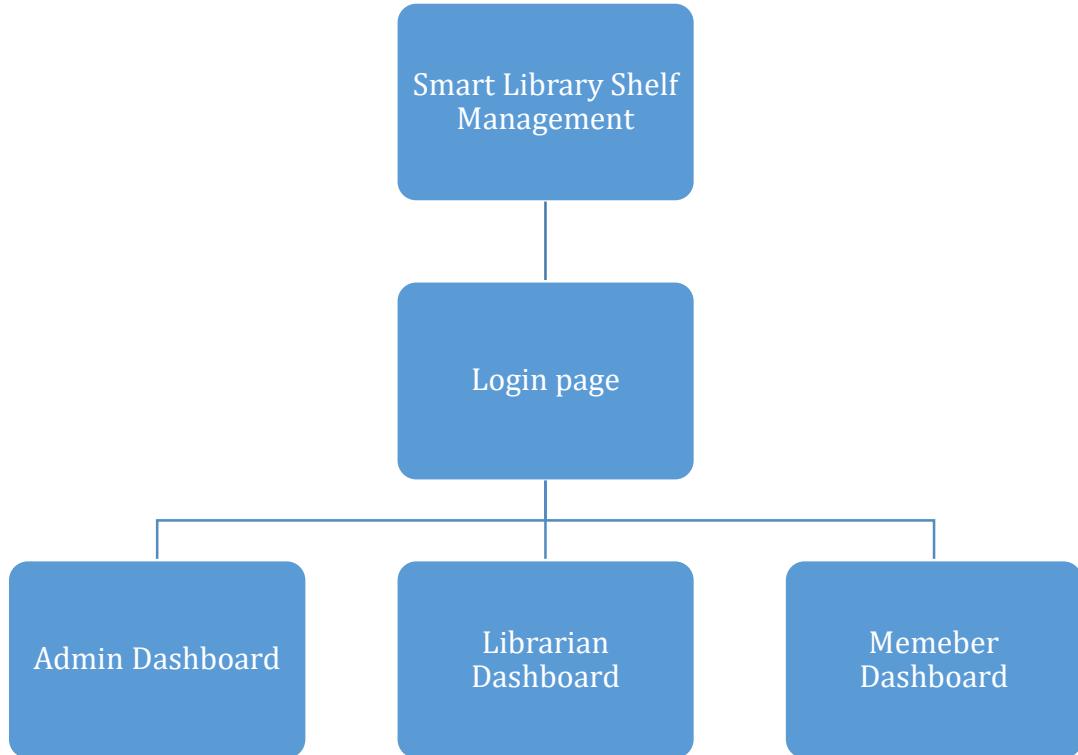


Figure 2.1 Entry Point Traversals

## Smart Library Shelf Management System

### 2.2.2 Administrator Dashboard Traversals.

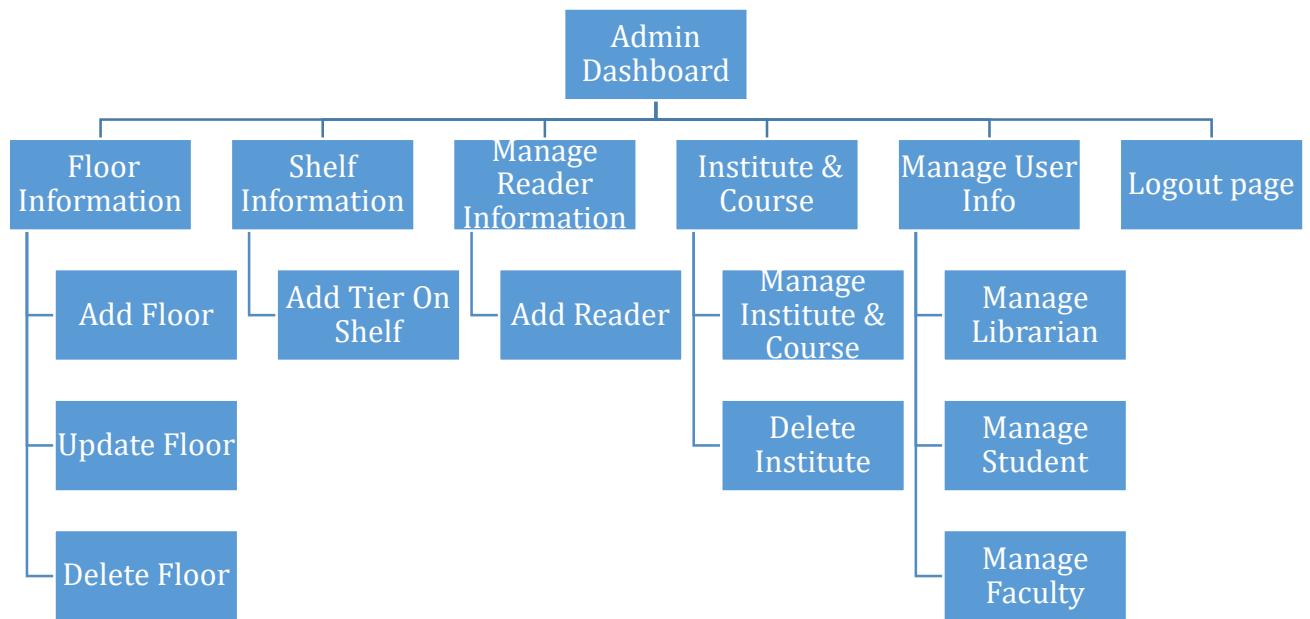


Figure 2.2 Administrator Dashboard Traversals

## Smart Library Shelf Management System

### 2.1.3 Librarian Dashboard Traversals

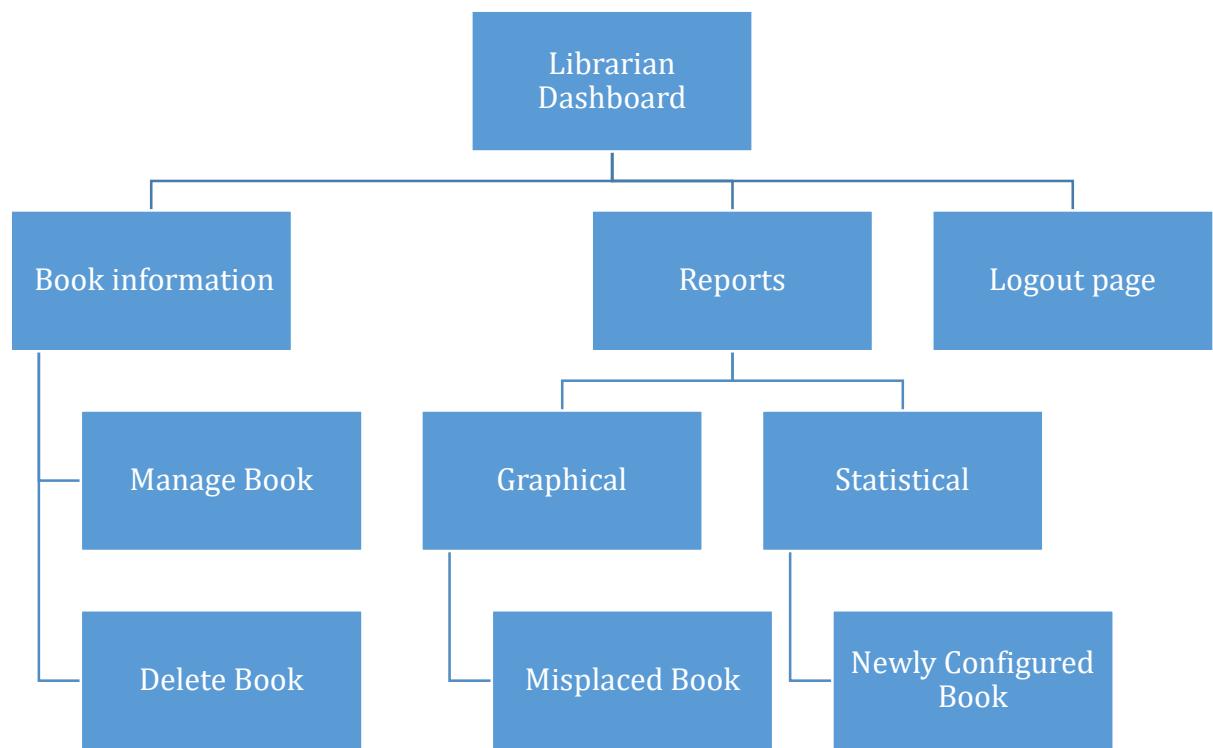


Figure 2.3 Librarian Dashboard Traversals

## Smart Library Shelf Management System

### 2.1.4 Member Dashboard Traversals

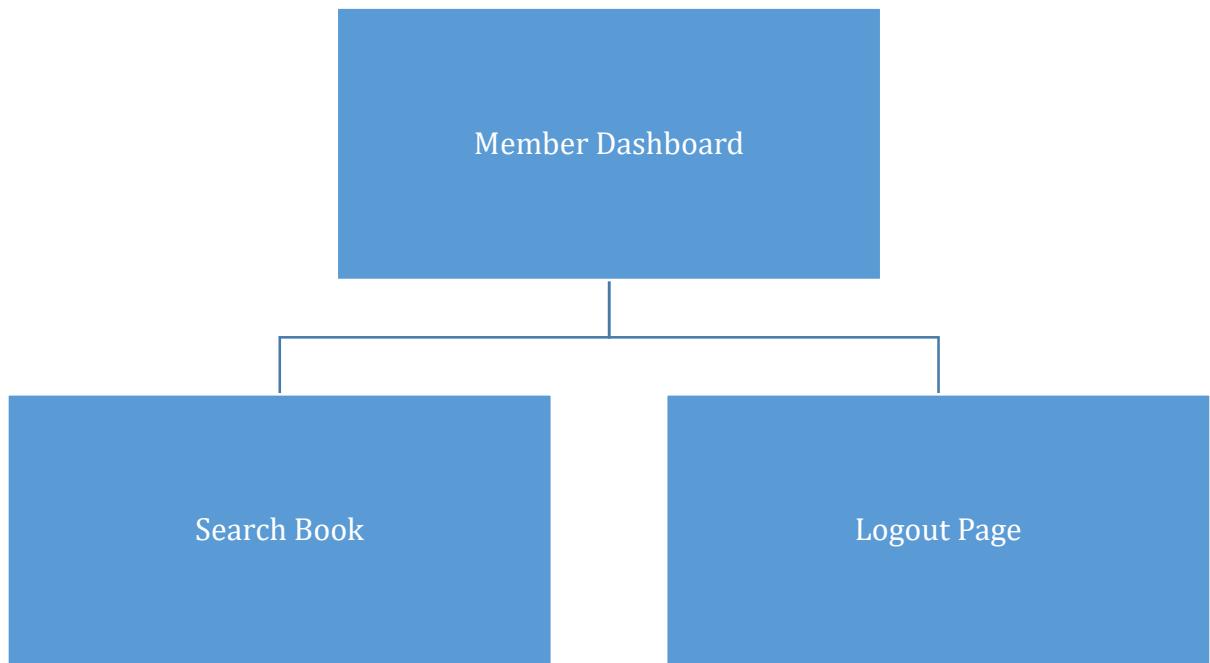


Figure 2.4 Member Dashboard Traversals

## 2.2 Screenshots

### 2.2.1 Login Functionality

#### 2.2.1.1 Login Page (For All User)

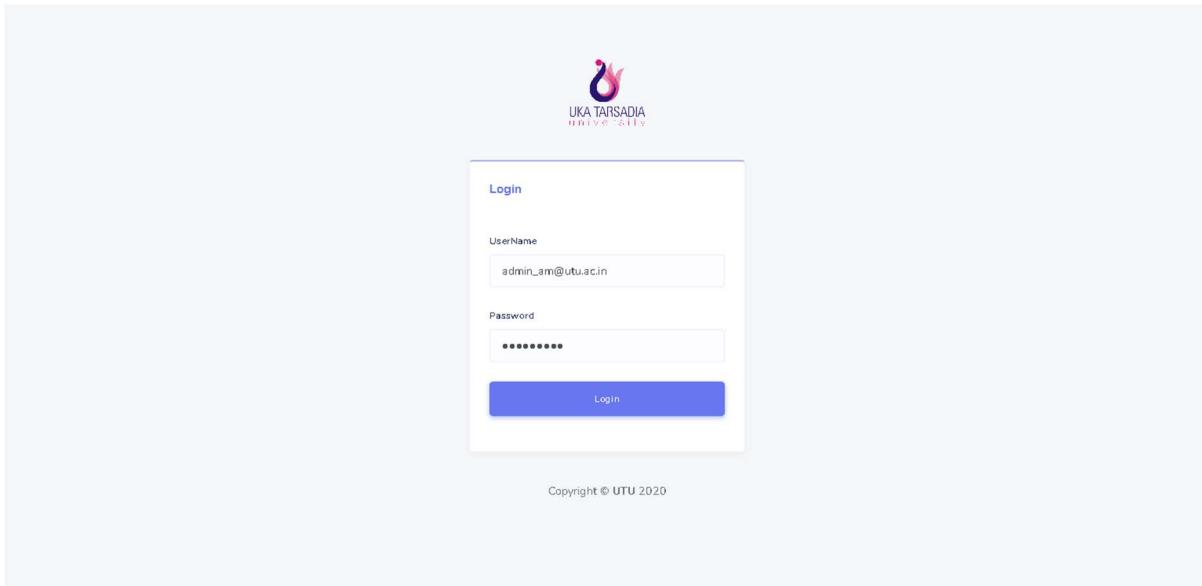


Figure 2.5 Login Page

#### 2.2.1.2 Login with Validation

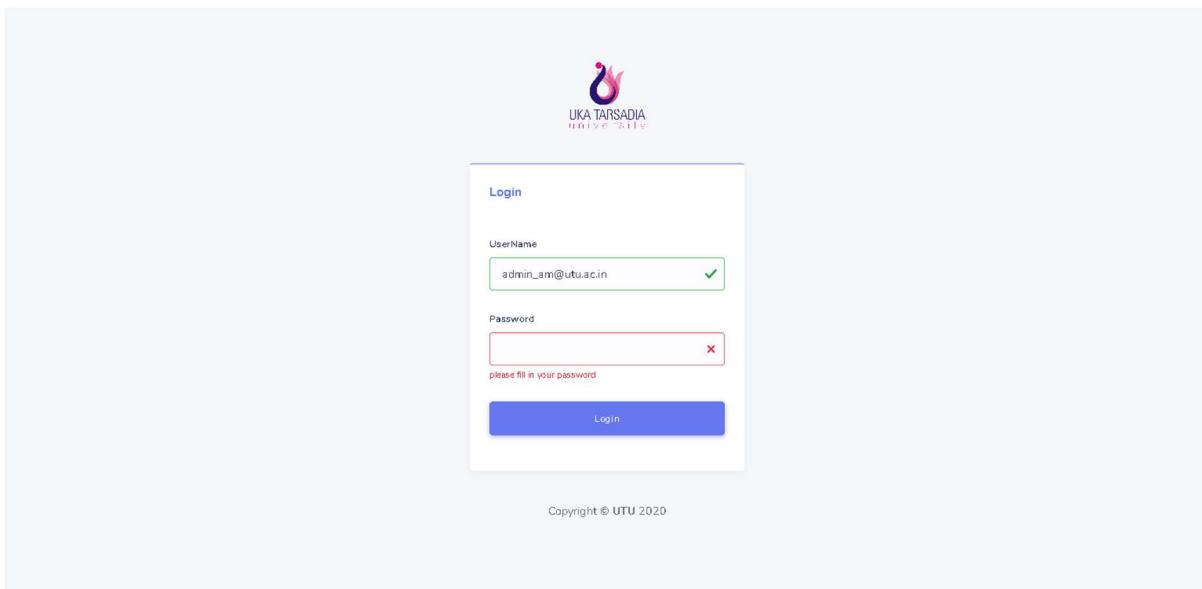


Figure 2.6 Login page with Validation

# Smart Library Shelf Management System

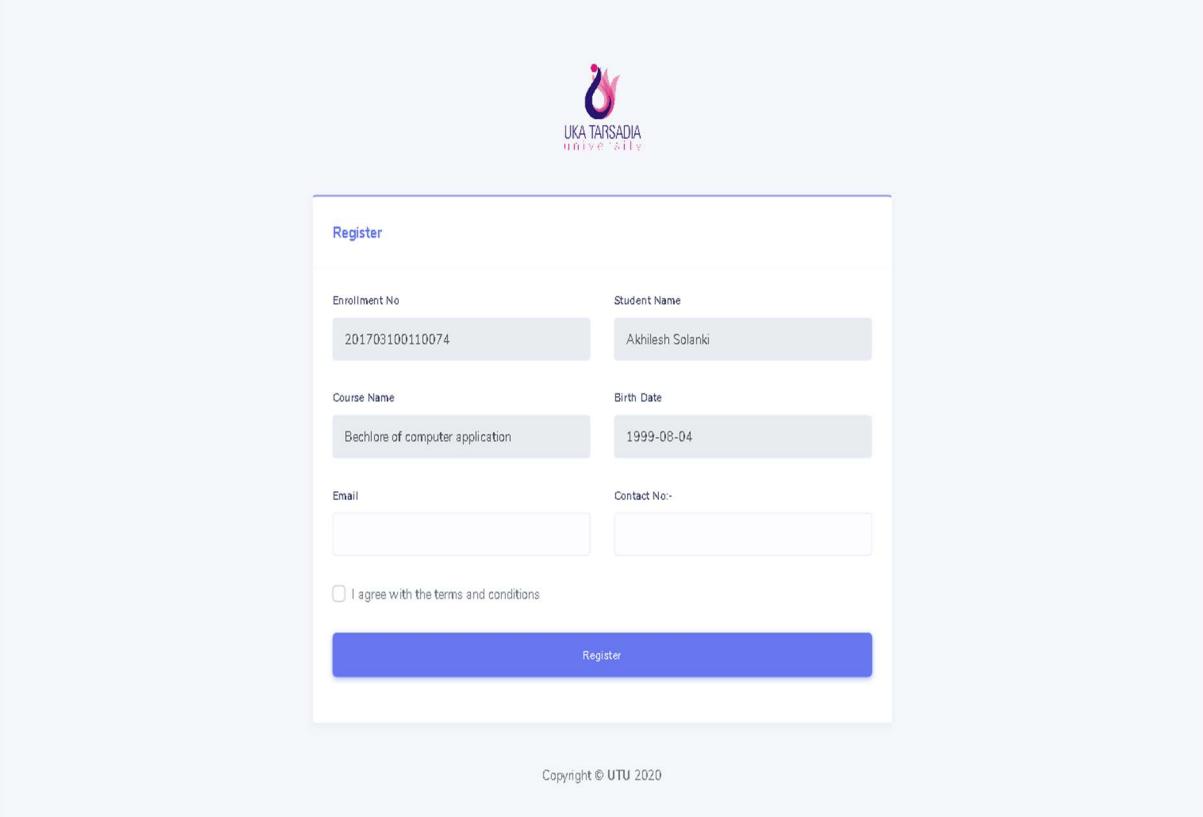
## Specification

<b>Description</b>	Login page for the Administrator, Librarian, Members through which respective dashboard and other functionalities can be access by providing user credentials.
<b>Data From</b>	tbl_studentinfo_master_slsms, tbl_facultyinfo_master_slsms, tbl_nativeuserinfo_master_slsms
<b>Data To</b>	Administrator, Librarian, Members (Student, Faculty)
<b>Critical Validation</b>	<ol style="list-style-type: none"><li>1. Username of the Admin and librarian should be - ^[a-zA-Z] + [ ] [a-zA-Z] +@utu.ac.in\$.</li><li>2. Username of Member (Faculty) should be - ^[a-zA-Z] +[.][a-zA-Z]<a href="mailto:@utu.ac.in\$">@utu.ac.in\$</a></li><li>3. Username of Member (Student) should be- [0-9]{15}</li></ol>

Table 2.1 Login Functionality Description

## 2.2.2 Registration Functionality

### 2.2.2.1 Registration Form for Members (Student & Faculty).



The screenshot shows a registration form titled "Register". At the top right is the logo of "UKA TARSADIA UNIVERSITY" featuring a stylized flame icon. The form fields include:

- Enrollment No: 201703100110074
- Student Name: Akhilesh Solanki
- Course Name: Bachelor of computer application
- Birth Date: 1999-08-04
- Email: (empty field)
- Contact No.: (empty field)
- A checkbox labeled "I agree with the terms and conditions" (unchecked).
- A blue "Register" button at the bottom.

At the bottom center of the page, it says "Copyright © UTU 2020".

Figure 2.7 Registration page

## Specification

<b>Description</b>	Registration Page for the Members (Student & Faculty) who are newly to the respective institutes.
<b>Data From</b>	tbl_studentinfo_master_slsms, tbl_facultyinfo_master_slsms, tbl_studentregistered_slsms, tbl_facultyregistered_slsms
<b>Data To</b>	Members (Student/Faculty)
<b>Critical Validation</b>	1. Personal email of Members (Student/Faculty) should be - ^( [\w] * [ \w\.] * (?!\.) @gmail.com ) \$

Table 2.2 Registration Functionality Description

# Smart Library Shelf Management System

## 2.2.3 Manage Floor Functionality (Administrator Functionality)

### 2.2.3.1 Add Floor & Add Shelf

The screenshot shows the 'Floor Information' section of the 'Shelf Management System'. On the left, a sidebar lists 'DASHBOARD', 'ADMINISTERING' (with 'Floor Information' selected), and 'REPORTS'. A blue button at the bottom left says 'SiteMap & Documentation'. The main area has a title 'Floor Information' and a sub-section 'Add Floor'. It contains three input fields: 'Floor Number' (set to 2), 'Maximum Number of Allowed Shelf' (set to 8), and 'Select Floor Main Section' (a dropdown menu showing 'Select Section'). At the bottom right of the main area is the text 'Copyright © UTU 2020'.

Figure 2.8 Add Floor and Add shelf

### 2.2.3.2 Select Section & Sub-Section

This screenshot is identical to Figure 2.8, showing the 'Add Floor' form. However, it includes two additional dropdown menus under 'Select Sub-Section': 'Alternate history' and 'Coming-of-age', both associated with a 'Select No of Shelves' dropdown set to 4. The 'Add Floor' button is located at the bottom of the form area.

Figure 2.9 Selecting Section and Sub-section for the floor shelves.

## Smart Library Shelf Management System

### 2.2.3.3 Update Floor

The screenshot shows the 'Floor Information' section of the system. On the left, a sidebar menu includes 'Dashboard', 'ADMINISTERING' (with 'Floor Information' selected), and 'REPORTS'. A blue button at the bottom left says 'SiteMap & Documentation'. The main area has a title 'Floor Information' and a sub-section 'Update Floor'. It features a dropdown menu for 'Select Floor no' with the value '1' selected. Below it are two radio buttons: 'Add shelf' (red) and 'Manage Shelf' (blue). A large blue 'submit' button is at the bottom.

Figure 2.10 Update Floor

### 2.2.3.4 Update Floor – Add Shelf

This screenshot shows the 'Floor Information' section with the 'Add Shelf' option selected. The 'Select Floor no' dropdown is set to '1'. Below it are two radio buttons: 'Add shelf' (red) and 'Manage Shelf' (blue). The interface is divided into three columns: 'Present Sub-Section' (containing 'Programming Language' and 'Cookbook'), 'Present No of Shelves' (containing '4' and '4'), and 'Select No of Shelves' (containing '6' and '9'). A green 'Add New Category' button is located below the sub-sections. At the bottom is a large blue 'submit' button.

Figure 2.11 Update Floor – Add Shelf Operation

## Smart Library Shelf Management System

### 2.2.3.5 Update Floor – Add Shelf – Add New Category

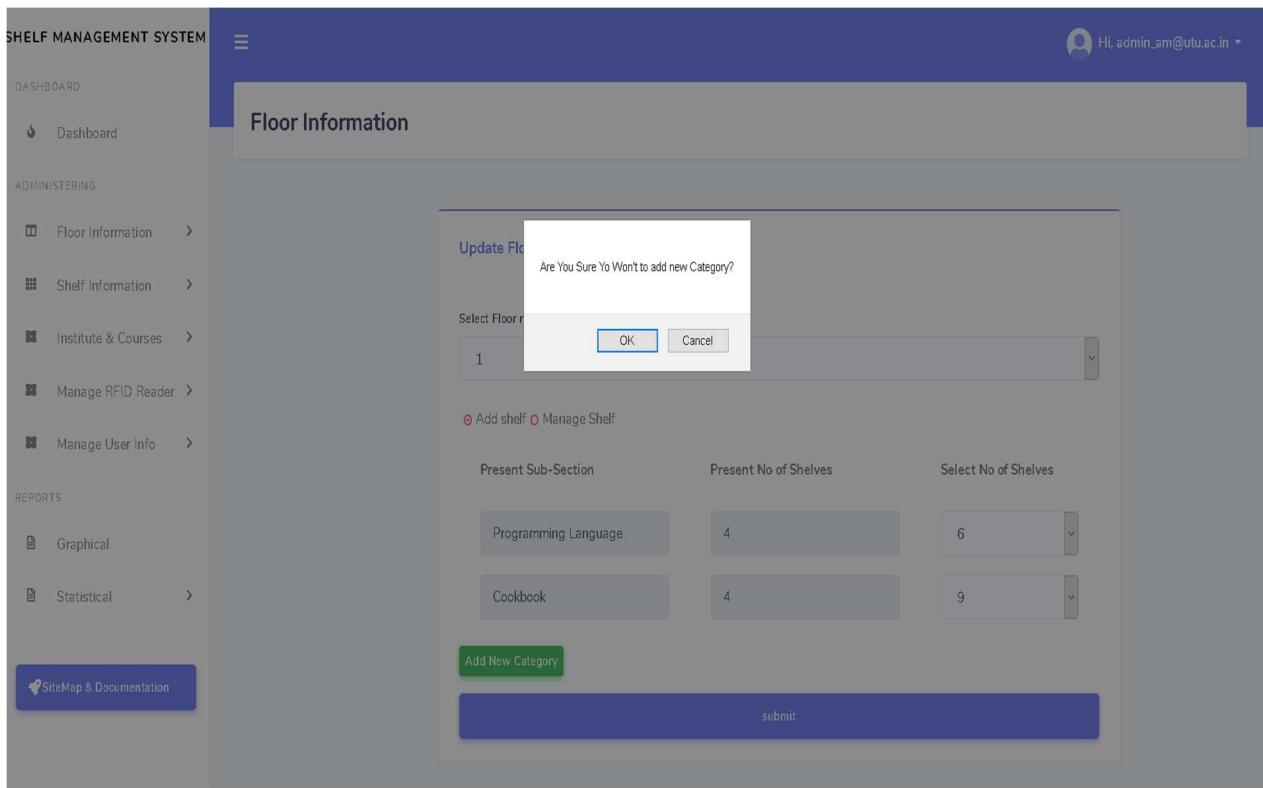


Figure 2.12 Update Floor – Add Shelf – Adding New Category.

### 2.2.3.6 Update Floor – Add Shelf – Validation

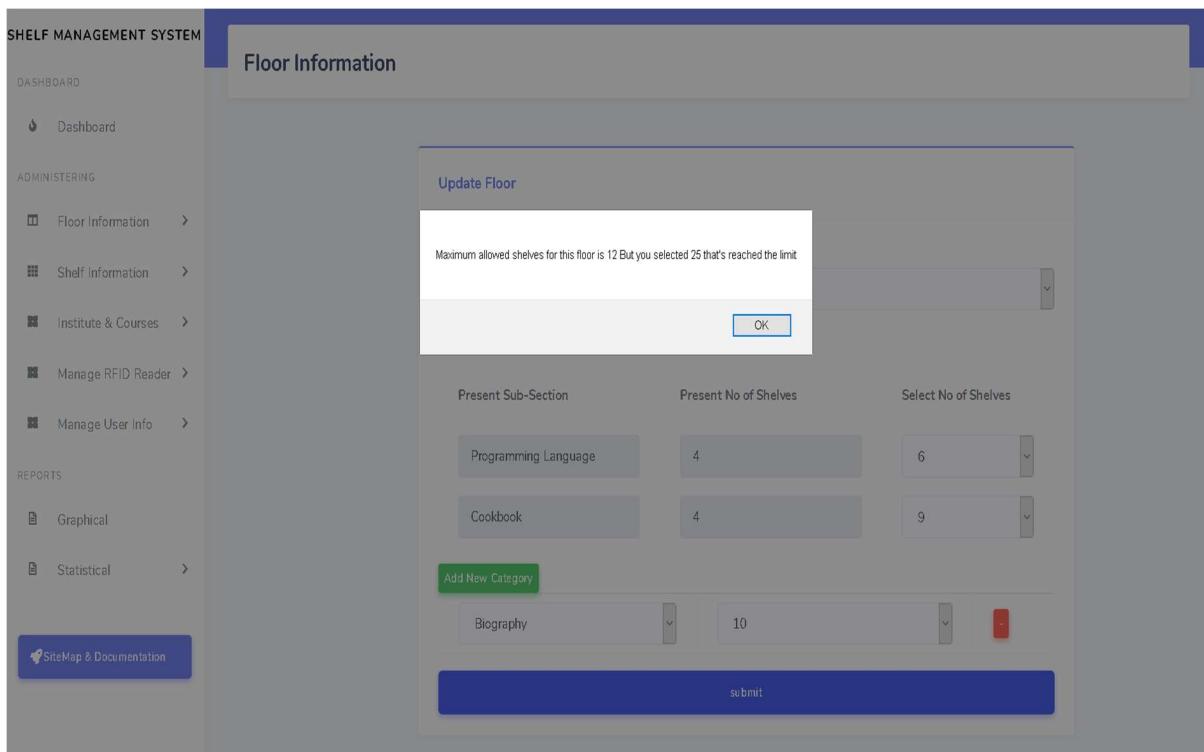


Figure 2.13 Update Floor – Add Shelf –Maximum Reached Limit Validation.

## Smart Library Shelf Management System

### 2.2.3.7 Update Floor – Manage Shelf

The screenshot shows the 'Floor Information' section of the 'Shelf Management System'. On the left, a sidebar menu includes 'Dashboard', 'AD MINISTERING' (with 'Floor Information' selected), 'REPORTS', and a 'SiteMap & Documentation' button. The main content area is titled 'Update Floor' and contains a 'Select Floor no' dropdown set to '1', and four radio button options: 'Add shelf', 'Manage Shelf', 'Delete Shelf', and 'Swap Shelf'.

Figure 2.14 Update Floor – Manage Shelf Information.

### 2.2.3.8 Update Floor – Manage Shelf – Delete Shelf

The screenshot shows the 'Floor Information' section of the 'Shelf Management System'. The sidebar menu is identical to Figure 2.14. The main content area is titled 'Update Floor' and includes 'Select Floor no' (set to '1'), 'Select Sub Section' (set to 'Programming Language'), 'Total No of Shelf' (set to '4'), 'Empty Number of shelf' (set to '2'), and 'Select no of shelf you won't to delete' (set to '1'). A blue 'submit' button is at the bottom.

Figure 2.15 Update Floor – Manage Shelf – Delete Shelf Information.

## Smart Library Shelf Management System

### 2.2.3.9 Update Floor – Manage Shelf – Swap Shelf

The screenshot shows the 'Floor Information' section of the 'Shelf Management System'. On the left, a sidebar lists 'DASHBOARD', 'ADMINISTERING' (with 'Floor Information' selected), and 'REPORTS'. A blue button at the bottom left says 'SiteMap & Documentation'. The main area has a title 'Floor Information' and a sub-section 'Update Floor'. It contains a dropdown 'Select Floor no' set to 1, and radio buttons for 'Add shelf', 'Manage Shelf', 'Delete Shelf', and 'Swap Shelf'. Below this is a dropdown 'Select Sub Section' set to 'Programming Lang'. There are two sets of input fields: 'Total No Of Shelf' (4) and 'Empty No of Shelf' (1). A note says 'select no of shelf that you won't add from upper sub selection'. At the bottom is a 'submit' button.

Figure 2.16 Update Floor – Manage Shelf – Swapping Shelf.

### 2.2.3.10 Delete Floor

The screenshot shows the 'Floor Information' section of the 'Shelf Management System'. The sidebar is identical to Figure 2.16. The main area has a title 'Floor Information' and a sub-section 'Delete Floor'. It contains a dropdown 'Floor Number' set to 1, and an input field 'Number of Shelf Present in Floor' set to 8. At the bottom is a 'Delete' button.

Figure 2.17 Delete Floor

## Smart Library Shelf Management System

### Specification

<b>Description</b>	Manage Floor Information functionality consist add, update and delete floor.  In Add Floor administrator can add the floor information like floor having how many shelves and the shelves belongs to which category & sub-category.  In Update Floor Administrator can either add a greater number of shelves on exiting floor or manage the shelves internally.  In Delete Floor Administrator can remove the Floor Information.
<b>Data From</b>	tbl_floorinfo_master_slsms, tbl_shelfmainsection_master_slsms, tbl_shelfsubsection_slsms, tbl_shelfinfo_slsms, tbl_categorywise_arrangement_onfloor_slsms
<b>Data To</b>	Administrator
<b>Critical Validation</b>	<ol style="list-style-type: none"> <li>1. In Add Floor, if the main-section of the shelf is not selected then it will not allow to select its subsection.</li> <li>2. Division of number of shelves on the floor section wise, sub-section wise and based on number of shelves selected for particular floor.</li> <li>3. In Update Floor, maximum no of allowed shelves on single floor is 20. So, if administrator is trying to add more than 20 then system will not permit to do this also if that particular floor already having maximum shelves then system will not display add shelf functionality.</li> <li>4. In Delete Floor, if that floor having shelves and that shelves having book on it then system will not permit to delete the floor.</li> </ol>

Table 2.3 Manage Floor Functionality Description

## Smart Library Shelf Management System

### 2.2.4 Manage Shelf Information (Administrator Functionality)

#### 2.2.4.1 Add tier on shelf

The screenshot shows the 'Shelf Information' page of the 'Shelf Management System'. The left sidebar has sections for DASHBOARD, ADMINISTERING (Floor Information, Shelf Information, Institute & Courses, Manage RFID Reader), and REPORTS (Graphical, Statistical). A 'Documentation' link is also present. The main area is titled 'Shelf Information' and contains a sub-section 'Add Shelf'. It has fields for 'Select Floor' (set to 8) and 'Select Subsection' (set to Programming). Below is a table with 13 rows for 'Shelf No.' and 'Select No of Tiers'. At the bottom is a 'Submit' button.

Figure 2.18 Adding tier on shelf

## Specification

<b>Description</b>	Manage Shelf page is for adding the new information of the shelf, selecting number of tiers for the shelf.
<b>Data From</b>	tbl_floorinfo_master_slsms, tbl_shelfsubsection_slsms, tbl_shelfinfo_slsms, tbl_shelftierconfiguration_slsms
<b>Data To</b>	Administrator
<b>Critical Validation</b>	1. If the floor number is not selected the user can't select the sub-section as well as number of tiers on particular shelf.

Table 2.4 Manage Shelf Functionality Description

# Smart Library Shelf Management System

## 2.2.5 Manage RFID Reader Information (Administrator Functionality)

### 2.2.5.1 Add Reader

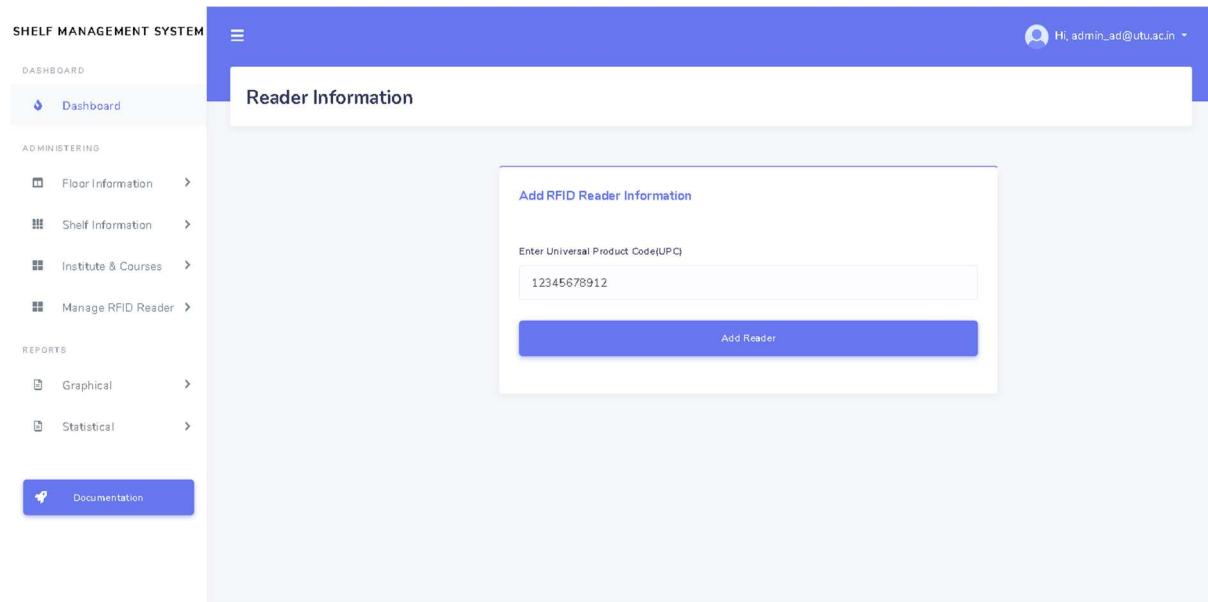


Figure 2.19 Adding new Reader in to System.

## Specification

<b>Description</b>	Manage RFID Reader Functionality is for adding new Reader into the system.
<b>Data From</b>	tbl_rfid_reader_configuration_slsms
<b>Data To</b>	Administrator
<b>Critical Validation</b>	<ol style="list-style-type: none"><li>Regular experience of Universal Product Code</li><li>After adding the Reader information system will assign reader to the shelf tier automatically.</li></ol>

Table 2.5 Manage Reader Functionality Description

## Smart Library Shelf Management System

### 2.2.6 Manage Institute & Course (Administrator Functionality)

#### 2.2.6.1 Add Institute & Course

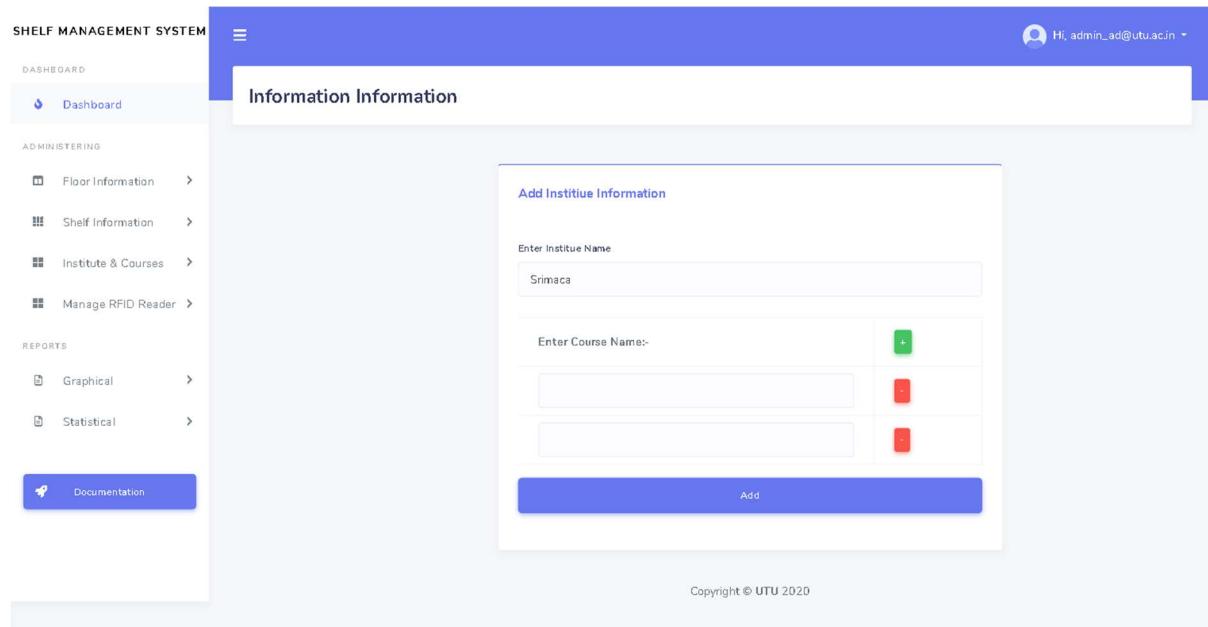


Figure 2.20 Adding New Institute and Course

#### 2.2.6.2 Validation on Institute Name

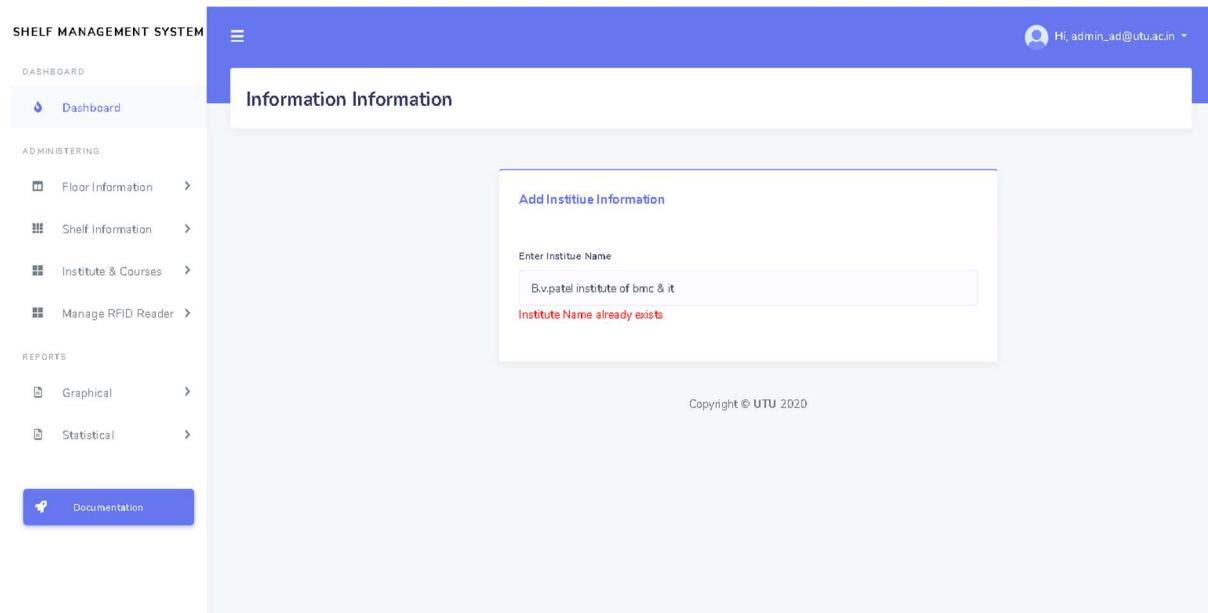


Figure 2.21 Validation: Institute already exists

## Specification

<b>Description</b>	Institute information page is for adding the information of newly added department to the university
<b>Data From</b>	tbl_coursedetails_slsms, tbl_instituteinfo_master_slsms
<b>Data To</b>	Administrator
<b>Critical Validation</b>	<ol style="list-style-type: none"><li>1. User cannot add one department multiple time.</li><li>2. Institute name must be greater than 6 characters.</li></ol>

Table 2.6 Manage Institute & Course Functionality Description

## Smart Library Shelf Management System

### 2.2.7 Manage User (Administrator Functionality)

#### 2.2.7.1 Manage Librarian

The screenshot shows the 'Manage Librarian Profile' page of the Shelf Management System. On the left, there's a sidebar with 'Dashboard', 'ADMINISTERING' (Floor Information, Shelf Information, Institute & Courses, Manage RFID Reader, Manage User Info), and 'REPORTS' (Graphical, Statistical). At the bottom of the sidebar is a 'SiteMap & Documentation' button. The main content area has a header 'Manage Librarian Profile' and a sub-header 'Librarian List'. It displays two entries:

#	Name	username	change Email id	Change password	Account Status	Remove user
1	Mrugesh	librarian_lib1@utu.ac.in	<button>Change</button>	<button>Change</button>	Disable <input checked="" type="checkbox"/> Enable	<button>X</button>
2	Akhilesh	librarian_lib2@utu.ac.in	<button>Change</button>	<button>Change</button>	Disable <input checked="" type="checkbox"/> Enable	<button>X</button>

At the bottom right of the main content area, it says 'Copyright © UTU 2020'.

Figure 2.22 Manage Librarian

#### 2.2.7.2 Authentication of Administrator

This screenshot is similar to Figure 2.22, showing the 'Manage Librarian Profile' page. However, a modal window titled 'Authentication' is overlaid on the main content. The modal contains the instruction 'Enter Admin Password' and a text input field. In the bottom right corner of the modal is a blue 'OK' button. The background of the main page is dimmed, indicating the modal is active.

Figure 2.23 Re-Verification while Performing Various Critical Operation.

## Smart Library Shelf Management System

### 2.2.7.3 Add Librarian

The screenshot shows the 'Manage Librarian Profile' section of the application. On the left, there's a sidebar with 'DASHBOARD', 'ADMINISTERING' (Floor Information, Shelf Information, Institute & Courses, Manage RFID Reader, Manage User Info), 'REPORTS' (Graphical, Statistical), and a 'SiteMap & Documentation' link. The main area has a title 'Manage Librarian Profile' and a sub-section 'Librarian List'. It shows a table with columns: #, Name, username, change Email id, Change password, Account Status, and Remove user. One row is present for 'Mrugesh' with the username 'librarian.Lib1@utu.ac.in'. There are 'Change' buttons for Email id and Password, and a 'Disable' button with a blue switch followed by 'Enable'. A red 'X' button is also present. At the bottom of the interface, it says 'Copyright © UTU 2020'.

Figure 2.24 Add Librarian

### 2.2.7.4 Auto-Generate Username & Password sent on Email address

The screenshot shows a Gmail inbox with 1,612 messages. The message list includes 'Inbox' (1,612), 'Starred', 'Snoozed', 'Important', 'Sent', 'Drafts', 'Categories', 'Meet', 'Chat'. The message details are shown for an email from 'shelfmanagementproject@gmail.com' to 'to me'. The subject is 'Uka Trasadia University'. The message body contains the text: 'Your username is:- 'librarian.Lib2@utu.ac.in' and Password is:- Ejpeq37c&O''. The message was sent at 10:53 AM (0 minutes ago). The interface includes standard Gmail controls like Reply, Forward, Print, and Delete.

Figure 2.25 Username and Password sent on Gmail Account

## Smart Library Shelf Management System

### Specification

<b>Description</b>	Manage User Functionality is for managing the all user (Librarian, Student & Faculty).
<b>Data From</b>	tbl_nativeuserinfo_master_slsms, tbl_studentinfo_master_slsms, tbl_facultyinfo_master_slsms
<b>Data To</b>	Administrator
<b>Critical Validation</b>	<ol style="list-style-type: none"><li>1. Username &amp; Password are generated automatically and mailed for the newly added librarian.</li><li>2. Administrator can also enable &amp; disable users.</li></ol>

Table 2.6 Manage User Functionality Description

## Smart Library Shelf Management System

### 2.2.8 Manage Book Information (Librarian Functionality)

#### 2.2.8.1 Add Book Information

The screenshot shows the 'Book Information' section of the 'Shelf Management System'. On the left, a sidebar menu includes 'Dashboard', 'MANAGE' (with 'Book Information' selected), and 'REPORTS' (with 'Graphical' and 'Statistical' options). A blue button at the bottom of the sidebar says 'SiteMap & Documentation'. The main area is titled 'Add Book' and contains the following fields:

- Book Title:** Big Data and Analytics (green border with checkmark)
- Select Category of book:** Programming Language (dropdown menu)
- Book Author:** Seema Acharya (green border with checkmark)
- Book Publication:** Wiley (green border with checkmark)
- Book ISBN:** EAN Prefix: 978 (green border with checkmark), Registration group: 81 (green border with checkmark), Registrant: 2655 (green border with checkmark), Publication: 78 (green border with checkmark), Check digit: 2 (green border with checkmark)
- Book language:** English (green border with checkmark)
- Book Paperback:** 334 (green border with checkmark)
- Book dimension:** height: 21.49, width: 2.13, length: 21.17 (each with green border and checkmark)
- Book Quantity:** 200 (green border with checkmark)

A large blue 'Submit' button is at the bottom. At the very bottom of the page, the text 'Copyright © UTU 2020' is visible.

Figure 2.26 Add Book Information with Validation

# Smart Library Shelf Management System

## 2.2.8.2 Update Book

The screenshot shows the 'Book Information' section of the 'Shelf Management System'. On the left, there's a sidebar with 'DASHBOARD', 'MANAGE' (which has 'Book Information' selected), and 'REPORTS'. A blue button labeled 'SiteMap & Documentation' is also visible. The main area is titled 'Add Book' and contains the following fields:

- Book Title: Big Data and Analytics
- Book Category: Programming Language
- Book Author: Seema Acharya
- Book Publication: Wiley
- Book ISBN: 978-81-265-5478-2
- Book language: English
- Book Paperback: 334
- Book dimension:
  - height: 21.49
  - width: 2.13
  - length: 21.17
- Book Quantity: 1

A large blue 'Submit' button is at the bottom of the form.

Figure 2.27 Update Book Information (At the time of adding the book if title is already available then it asks for quantity only).

## Smart Library Shelf Management System

### Specification

<b>Description</b>	Manage Book Functionality is for adding the information of the newly added book to the library.
<b>Data From</b>	tbl_bookinfo_master_slsms, tbl_bookconfiguration_slsms, tbl_bookrfidconfiguration_slsms, tbl_notassignedbookslots_slsms, tbl_extraallbookslots_slsms
<b>Data To</b>	Librarian
<b>Critical Validation</b>	<ol style="list-style-type: none"><li>1. Book Title, Book Publication, Book Author, Book Language should contain alphabets only.</li><li>2. Book_ISBN should be of 13 characters only.</li><li>3. Book Paperback and Book dimensions should be in numeric values only.</li></ol>

Table 2.7 Manage Book Functionality Description

## Smart Library Shelf Management System

### 2.2.9 Search Book Functionality (Member Functionality)

#### 2.2.9.1 Search Book

The screenshot shows the 'Search Book' page of the Smart Library Shelf Management System. The top navigation bar includes 'SHELF MANAGEMENT SYSTEM', a user profile icon with the ID '201703100110074', and a 'SiteMap & Documentation' link. The main content area is titled 'Book Information' and contains a 'Add Book' section. Within this section, there are four radio buttons labeled 'Title', 'Author', 'ISBN', and 'Publication'. Below these buttons is a 'Submit' button.

Figure 2.28 Search book with different parameters.

#### 2.2.9.2 Search Book - AutoComplete Text-Box Functionality

The screenshot shows the 'Search Book' page with the 'Title' radio button selected. In the search input field, the letters 'Bi' are typed, and an autoComplete suggestion 'Big Data and Analytics' appears below the input field. The rest of the interface is identical to Figure 2.28, including the 'Submit' button at the bottom.

Figure 2.29 When Searching Book by parameter it will give the suggestion of the book that are already available in database.

## Smart Library Shelf Management System

### 2.2.9.3 Search Book- Display Statistical Location

The screenshot shows a web-based shelf management system. At the top left, it says "SHELF MANAGEMENT SYSTEM". On the right, there's a user profile icon with the text "Hi 201703100110074". Below the header, there's a "SEARCH" section with a "Search Book" button and a "SiteMap & Documentation" link. The main content area is titled "Book Information" and contains a "Add Book" form. The form includes fields for "Title" (radio button selected), "Author", "ISBN", and "Publication". A search bar contains the text "Big Data and Analytics". Below the search bar is a "Submit" button. A table below the search bar shows the results: "FloorNO" (1), "Shelf" (S103), and "Tier" (S103\_1). A "map" button is located at the bottom right of the table.

Figure 2.30 Display the searched book location in the form of statistical report.

### 2.2.9.4 Search Book – Display Graphical Representation

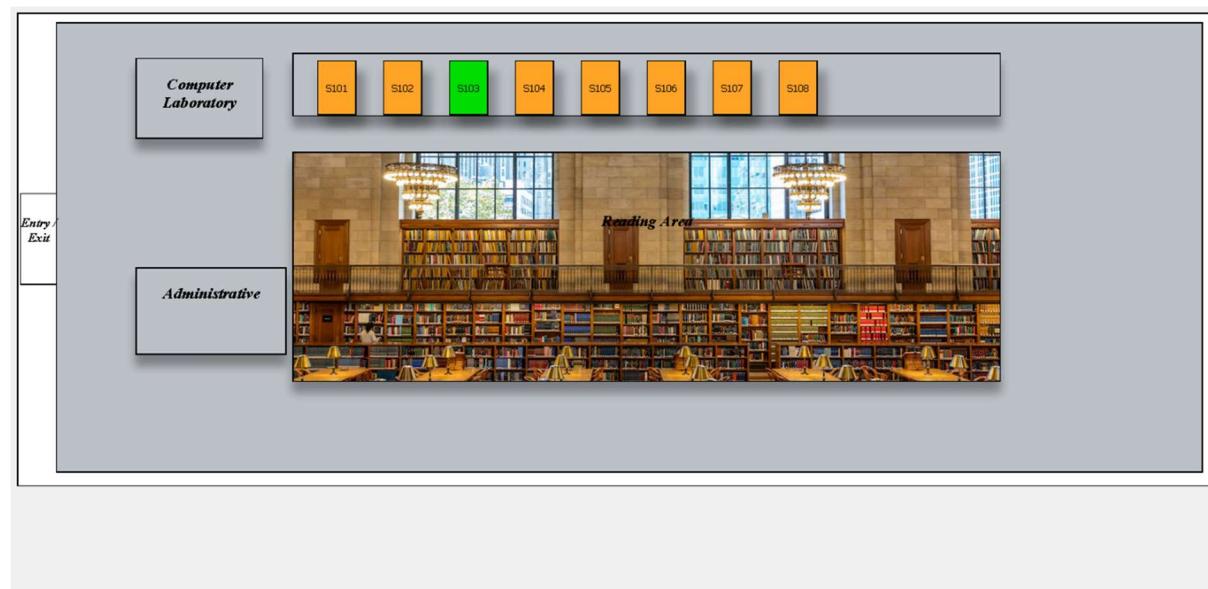


Figure 2.31 Display the searched book location as a graphically and green shelf denoted the location of the book.

## Smart Library Shelf Management System

### 2.2.9.5 Search Book – Display Shelf & tier of the Book

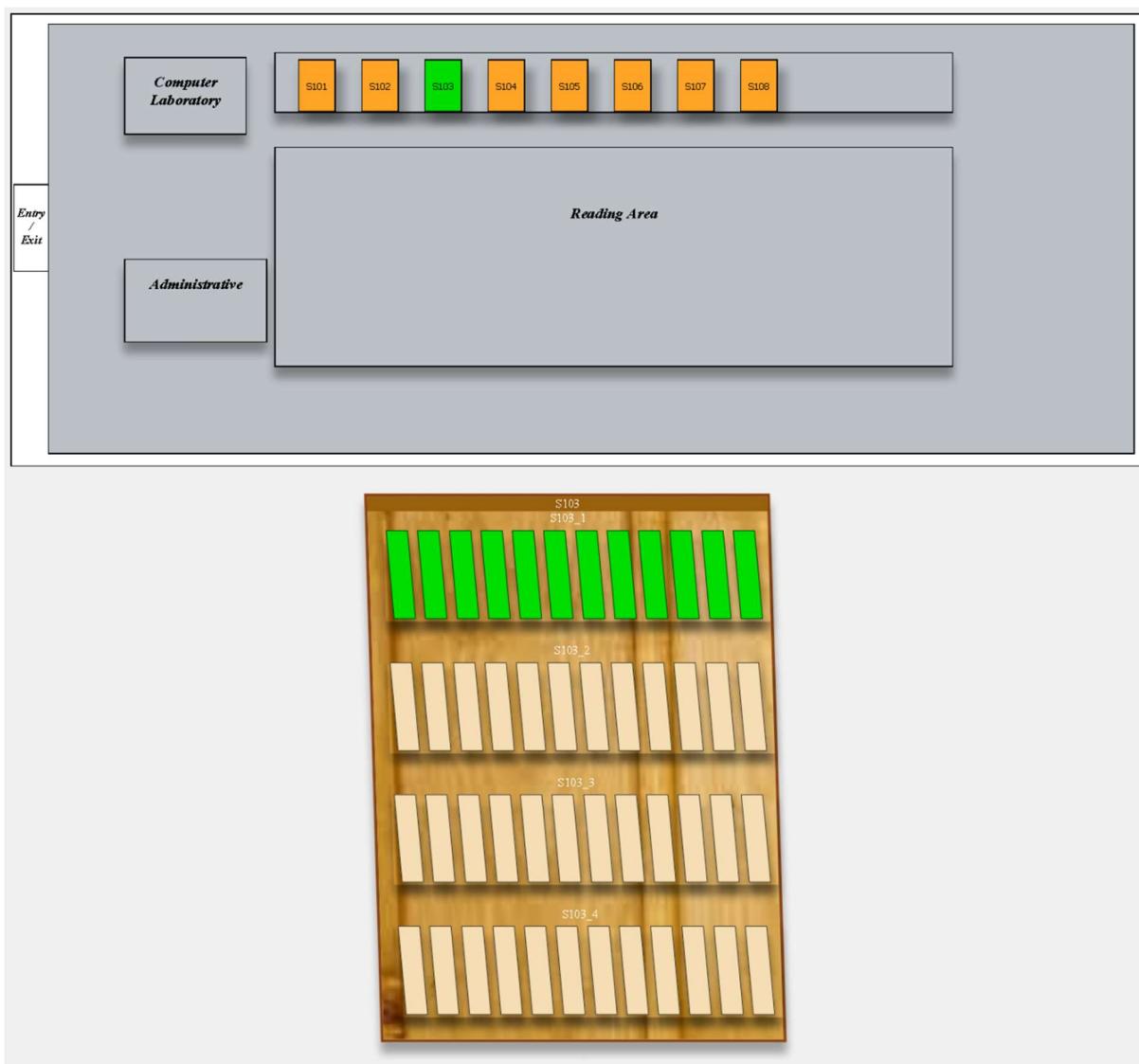


Figure 2.32 After Click on the green shelf its display shelf as well as in which tier that book is present.

# Smart Library Shelf Management System

## Specification

<b>Description</b>	Search book functionality is for searching the books with different-different parameter like author wise, title wise etc. After search it will generate statistical report of location of the book and then if user click on map so system will generate graphical location of the library as well as shelf and book.
<b>Data From</b>	Firebase Remote Location Server, tbl_shelftierconfiguration_slsms, tbl_shelfinfo_slsms
<b>Data To</b>	Members
<b>Critical Validation</b>	1. When user is searching the book at that time book suggestion will generate by the system just like auto complete text functionality.

Table 2.8 Search Book Functionality Description

## 2.3 IoT Devices Screenshot & Description

### 2.3.1 Real Image of the Hardwar Mechanism

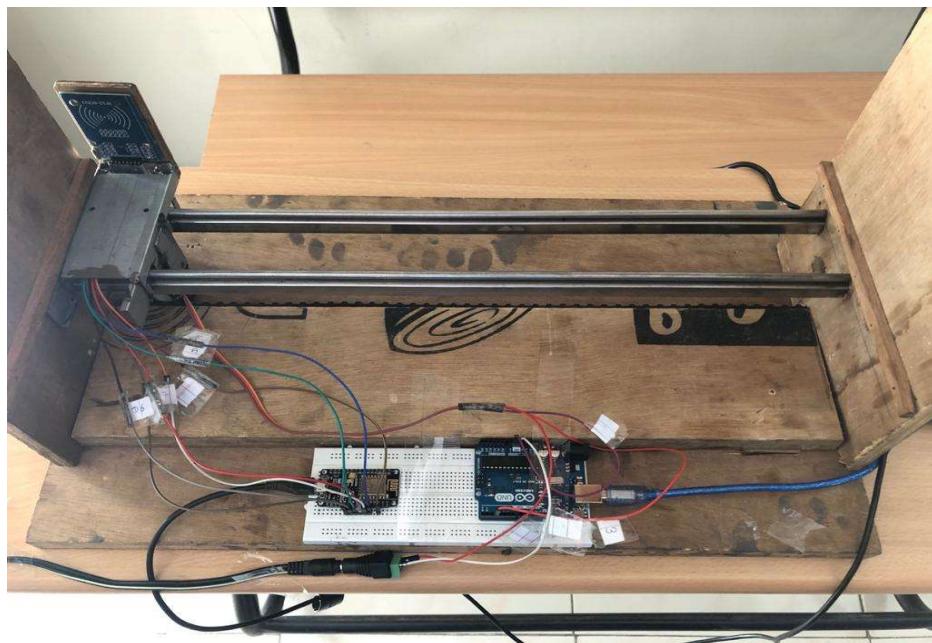


Figure 2.33 Image of all the hardware devices.

### 2.3.2 Working Image of RFID Reader

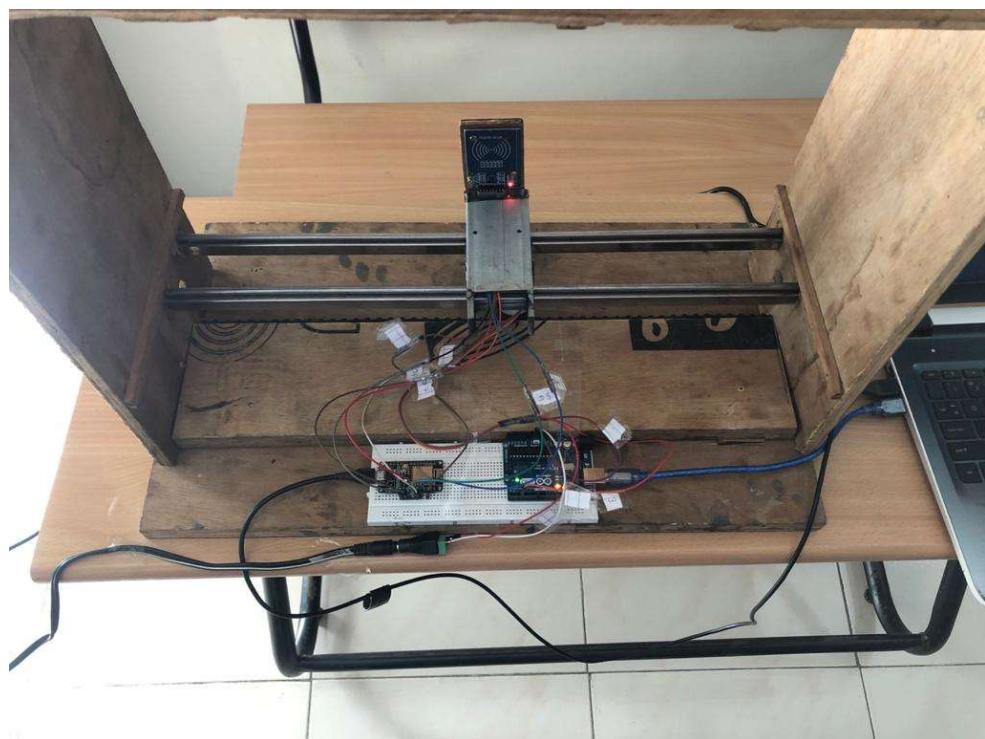


Figure 2.34 Working Image of all the hardware component.

# Smart Library Shelf Management System

### **2.3.3 Virtual Connection of all the devices**

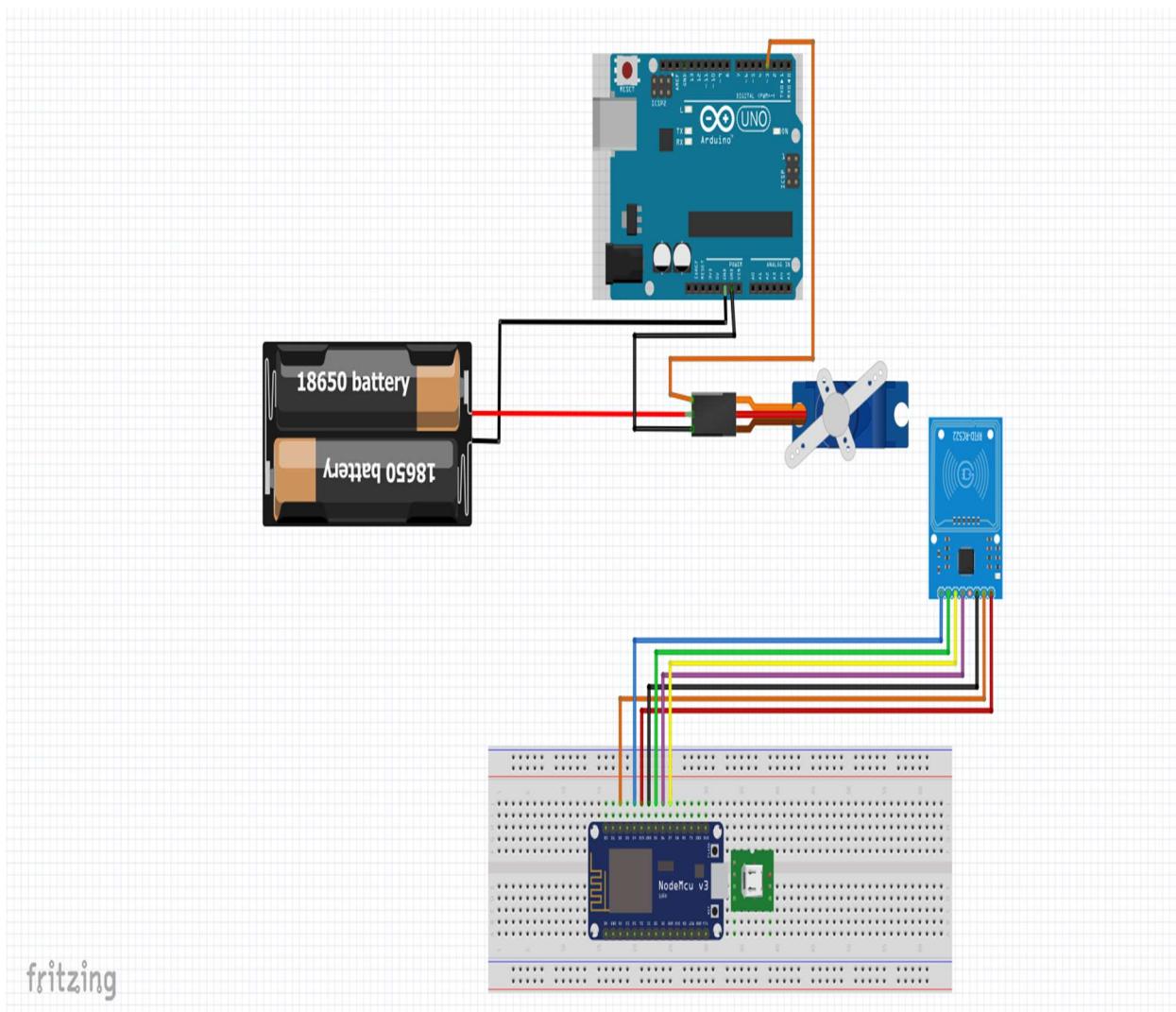


Figure 2.35 Virtual Connection of all the devices.

## 2.3.4 Description

### 2.3.4.1 NODE MCU TO RFID Reader Connection

Sr. No	Node Pin	MCU Pin	RFID Reader Pin	Description
1	3.3 v	3.3 v		The 3.3V pins are the output of an on-board voltage regulator.
2	RST(D2)	RST		Reset pin – used to reset or power down the module.
3	GND	GND		GND is a ground pin of ESP8266 Node MCU & RFID Reader development board.
4	MISOI(D6)		MISO/SCL/Tx	MISO pin when used for SPI communication, acts as SCL for I2c and Tx for UART.
5	MOSI(D7)		MOSI	Master out slave in pin for SPI communication
6	SCK(D5)		SCK	Serial Clock pin – used to provide clock source.
7	SS/SDA/Rx(D4)		SS/SDA/Rx	Acts as Serial input (SS) for SPI communication, SDA for IIC and Rx during UART.

Table 2.9 Node MCU To RFID Reader Connection

## Smart Library Shelf Management System

### 2.3.4.2 Arduino Uno to Servo Motor Connection

Sr. No	Arduino Uno Pin	Servo Motor Pin	Description
1	5 voltage	5 voltage	The 5V pins are the output of an on-board voltage regulator.
2	Pulse Width Modulation (PWM-3)	Pulse Width Modulation (PWM)	It is used to convert the digital signal into an analog by varying the width of the Pulse. The PWM pins are used for giving the desired analog output
3	GND	GND	The GND pins are used to close the electrical circuit and provide a common logic reference level throughout your circuit. Always make sure that all GNDs (of the Arduino, peripherals and components) are connected to one another and have a common ground.

Table 2.10 Arduino UNO to Servo Motor Connection

## 2.4 Error Page with Description

### 2.4.1 Error code 404 Not Found Page

Screenshot

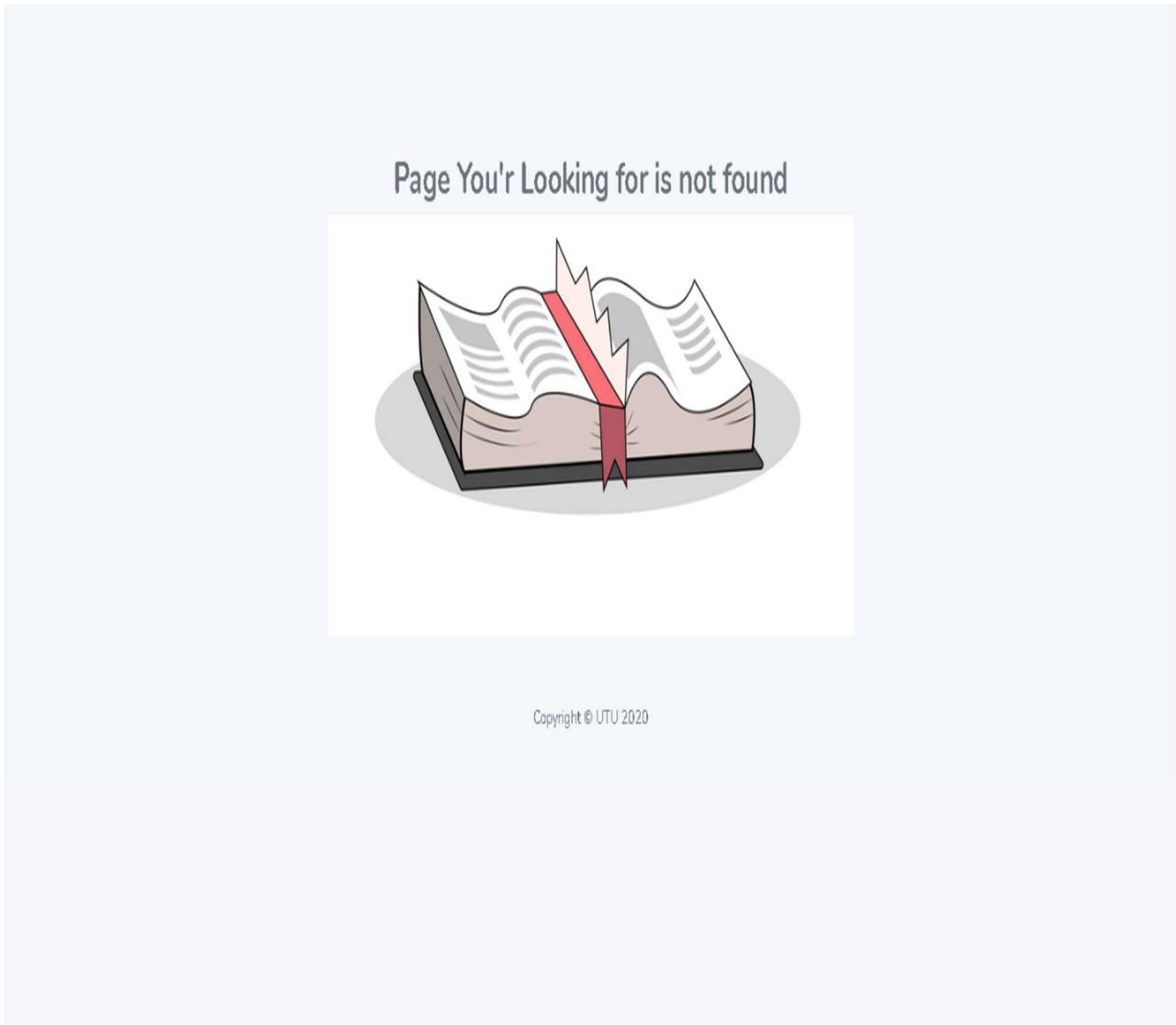


Figure 2.36 Error page 404 not found

## Smart Library Shelf Management System

### Description

Error page	Description
Error404.html	<p>Following are the reasons why an error message could appear.</p> <ul style="list-style-type: none"><li>• The URL or its content (such as files or images) was either deleted or moved (without adjusting any internal links accordingly).</li><li>• The URL was written in correctly (during the creation process or a redesign), linked incorrectly, or typed into the browser incorrectly.</li><li>• The server responsible for the website is not running or the connection is broken.</li><li>• The requested domain name can't be converted to an IP by the domain name system (DNS)</li><li>• The entered domain name doesn't exist (anymore).<sup>[21]</sup></li></ul>

Table 2.11 Error page 404 not found Description

### 2.4.2 Error Code 403 Forbidden Page

#### Screenshot



Figure 2.37 Error page 403 Forbidden

#### Description

Error page	Description
Error403.html	The 403 Forbidden error is an HTTP status code that means that accessing the page or resource you were trying to reach is absolutely forbidden for some reason. <sup>[22]</sup>

Table 2.12 Error page 403 Forbidden Description

### 2.4.3 Error code 500 Internal Server Error

#### Screenshot

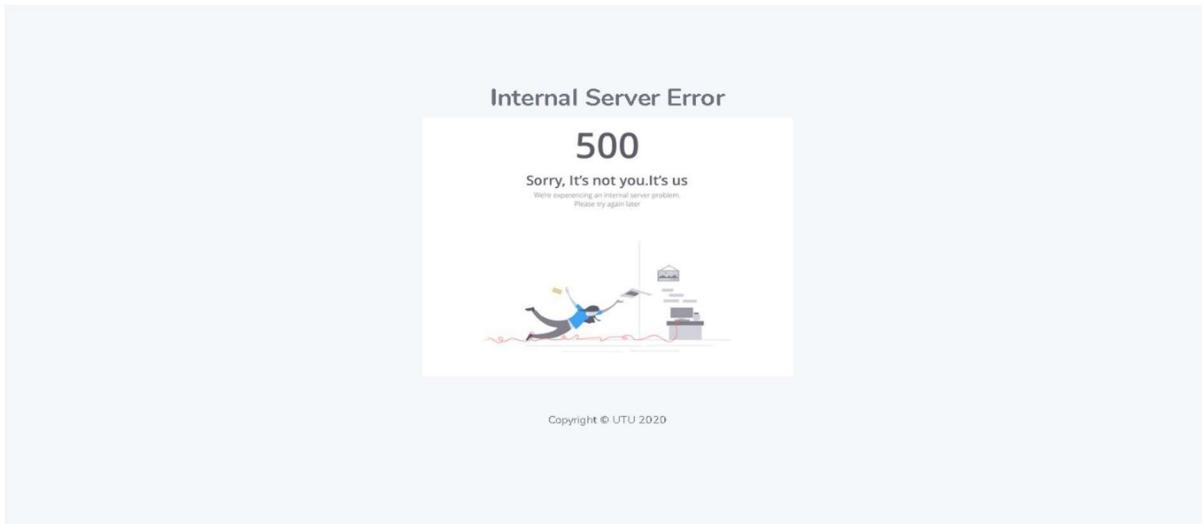


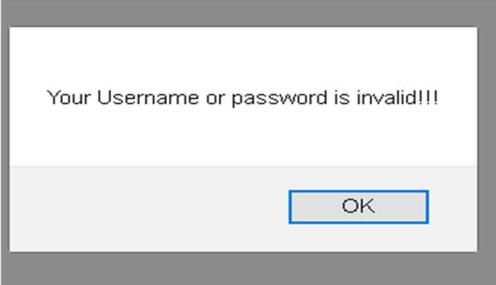
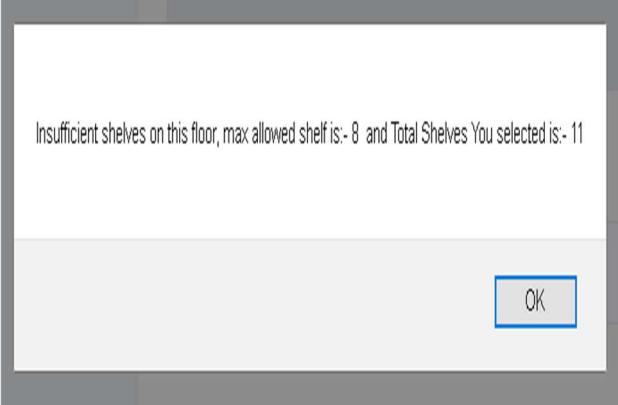
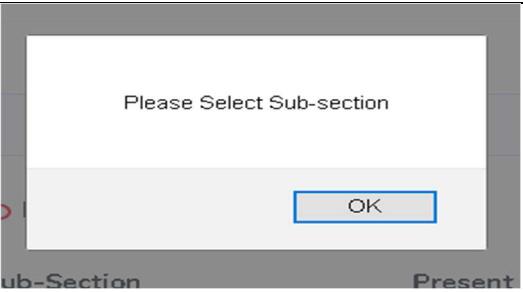
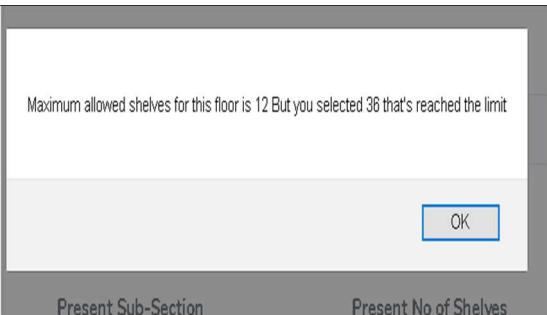
Figure 2.38 Error page 505

#### Description

Error page	Description
Error403.html	The 500 Internal Server Error is a very general <a href="#">HTTP status code</a> that means something has gone wrong on the website's server, but the server could not be more specific on what the exact problem is.[21]

Table 2.13 Error page 500 Internal Server Error Description

#### 2.4.4 List of dialog boxes with Description.

Sr. No	Error Dialog	Description
1.		In case of Invalid Username and Password while <u>login</u> attempts.
2.		In case of submitting floor information at that time first it takes maximum number of shelf then we need to select subsections so all the sun section shelf total can't be exceeded.
3.		In case of submitting floor information at that time admin need to choose the sub- section if he/she not selected and press submit button at that time error occurred.
4.		In case of updating floor. The Maximum number of allowed shelves is 20. If Admin select more then 20 then this message is render.

## Smart Library Shelf Management System

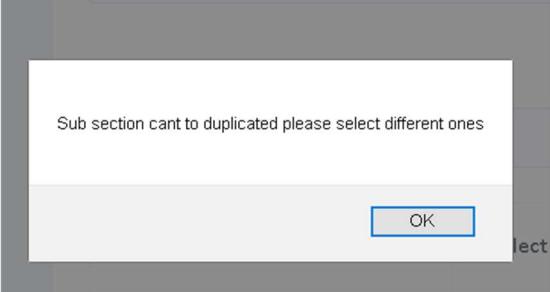
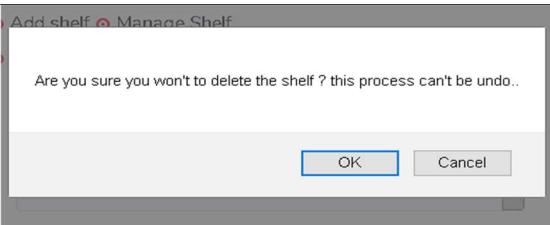
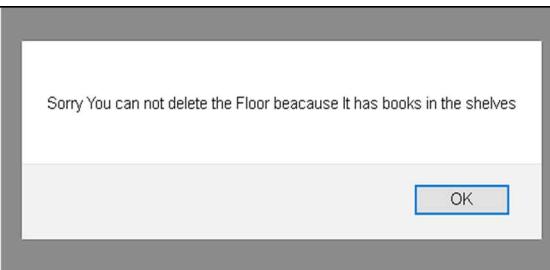
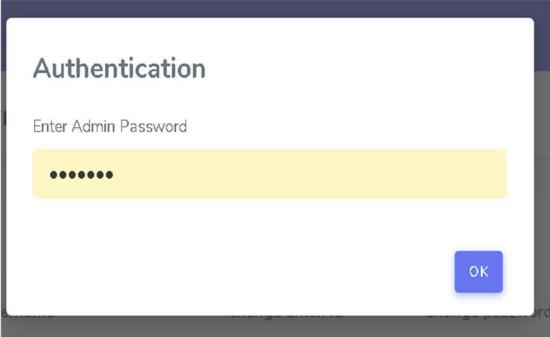
5.		In the Updating Floor & adding Floor functionality if admin selected same sub-section more than one time at that time it renders that subsection can't be duplicate.
6.		In update floor functionality delete shelf option is available at that time it's ask confirmation that are you sure because this thing can't be undo.
7.		In delete floor functionality if admin is trying to deleting the at that floor having a shelf and that shelf having a book at that time this message is render.
8.		In Manage User Functionality if admin try to perform critical operation like deleting user etc. at that time system will re-authenticate the user at that time this message is render.

Table 2.14 List of dialog boxes with description

## **2.5 Summary**

<b>Functionality</b>	<b>Total Pages</b>	<b>No of Validation</b>	
		<b>Built-in</b>	<b>Customized</b>
Functionality -1	3	2	6
Functionality -2	2	6	3
Functionality -3	7	3	35
Functionality -4	2	-	5
Functionality -5	2	4	32
Functionality-6	2	-	2
Functionality-7	2	-	4
Functionality-8	2	4	20
Functionality-9	3	3	18
Functionality-10	8	2	27
<b>Total</b>	<b>33</b>	<b>24</b>	<b>152</b>

Table 2.15 List of dialog boxes with description

## Chapter -3 Coding Specification

### 3.1 Coding standard

#### 3.1.1 Critical Code

##### 3.1.1.1 IoT Code

➤ ARDUINO -SERVO MOTOR CODE

```
#include<Servo.h>
#include <SoftwareSerial.h>

Servo;
int pos1;

void setup () {Serial.begin(9600); servo. attach (3);}

void loop ()
{
    servo. write (180); //rotate servo Motor Anti-clock wise
    delay (6900); //stop Servo for given time
    servo. write (0); //rotate servo mortar clock wise
    delay (6900); //stop Servo for given time
    servo. detach ();
    delay (1800000); //stop Servo for 30 minutes
    servo. attach (3);
}
```

➤ NODE MCU-RFID READER & FIREBASE CLOUD CODE

```
/*
***** Library Files *****/
#include <ESP8266WiFi.h>
#include <FirebaseArduino.h>
#include <SPI.h>
#include <MFRC522.h>
#include<Servo.h>

#define RST_PIN D2 // Configurable, see typical pin layout above
#define SS_PIN D4 // Configurable, see typical pin layout above
#define SS_1_PIN D4
#define NR_OF_READERS 2
```

## Smart Library Shelf Management System

```
// List of Variables
String Name=""; //Rfid Variable
int Reader; //Rfid Variable
Servo; //servo variable
MFRC522 mfrc522[NR_OF_READERS]; // Create MFRC522 instance
byte ssPins[] = {SS_PIN,SS_1_PIN};

// For Firebase Connection
#define FIREBASE_HOST "testingdata-1ea4f.firebaseio.com"
#define FIREBASE_AUTH "CM8Anj09DcDwYX6tZ1wh5VWSMCrtKamx9CAVKZXS"
#define WIFI_SSID "Amit Vallecha" // MERCUSYS_AE90 //wifi Id
#define WIFI_PASSWORD "123456789" // maaz7316 //Password
//*****
***/
void setup() {
    Serial.begin(9600); // Initialize serial communications with the PC
    SPI.begin(); // Init SPI bus
    servo.attach(D1);
    for (uint8_t reader = 0; reader < NR_OF_READERS; reader++) {
        mfrc522[reader].PCD_Init(ssPins[reader], RST_PIN); // Initialize each MFRC522 card

        //mfrc522[reader].PCD_DumpVersionToSerial();
    }
    // connect to wifi.
    WiFi.begin(WIFI_SSID, WIFI_PASSWORD); //Establish Wifi Connection
    Serial.print("connecting");
    while (WiFi.status() != WL_CONNECTED) {
        Serial.print(".");
        delay(500);

    }
    Serial.println();
    Serial.print("connected: ");
    Serial.println(WiFi.localIP());
    Firebase.begin(FIREBASE_HOST, FIREBASE_AUTH); //Establish Connection to firebase
```

## Smart Library Shelf Management System

```
}

void loop()
{
// Prepare key - all keys are set to FFFFFFFFFFh at chip delivery from the factory.
MFRC522::MIFARE_Key key;
for (byte i = 0; i < 6; i++) key.keyByte[i] = 0xFF;

byte block;
byte len;
MFRC522::StatusCode status;

for (uint8_t reader = 0; reader < NR_OF_READERS; reader++) {
// Look for new cards
// Reset the loop if no new card present on the sensor/reader. This saves the entire
process when idle.
if (mfrc522[reader].PICC_IsNewCardPresent() &&
mfrc522[reader].PICC_ReadCardSerial()) {

Serial.print(F("Reader :"));
Reader=reader+1;
Serial.print(reader);
byte buffer1[16];

block = 4;
len = 18;

//----- GET FIRST NAME-----
status = mfrc522[reader].PCD_Authenticate(MFRC522::PICC_CMD_MF_AUTH_KEY_A, 4,
&key, &(mfrc522[reader].uid));
if (status != MFRC522::STATUS_OK) //Check Authentication
{
Serial.print(F("Authentication failed: "));
Serial.println(mfrc522[reader].GetStatusCodeName(status));
return;
}
```

## Smart Library Shelf Management System

```
status = mfrc522[reader].MIFARE_Read(block, buffer1, &len); //Read The data from
RFID Tag
if (status != MFRC522::STATUS_OK) {
Serial.print(F("Reading failed: "));
Serial.println(mfrc522[reader].GetStatusCodeName(status));
return;
}
Name = String((char *)buffer1); //Convert Data Byte Array to String
Serial.println("Value:");
Serial.println(Name);
String Path="/Reader_"+String(Reader);
Firebase.pushString(Path,Name); //Send data to firebase
// handle error
if (Firebase.failed()) {
Serial.print("Sending failed.....");
Serial.println(Firebase.error());
return;
}
mfrc522[reader].PICC_HaltA();
mfrc522[reader].PCD_StopCrypto1();}}
```

### 3.1.1.2 Display Misplaced Book Functionality (Librarian Functionality)

#### ➤ Firebase Script

```
// Your web app's Firebase configuration
var firebaseConfig = {
  apiKey: "AIzaSyAs1jR5QXPpPTSGwrQG6jb6j2ZqTJg56Wo",
  authDomain: "mytesting-d13a7.firebaseio.com",
  databaseURL: "https://mytesting-d13a7.firebaseio.com",
  projectId: "mytesting-d13a7",
  storageBucket: "mytesting-d13a7.appspot.com",
  messagingSenderId: "923858135834",
  appId: "1:923858135834:web:d1213b256c645abd389aa3",
  measurementId: "G-8JE053NJ1K"
};
```

## Smart Library Shelf Management System

```
// Initialize Firebase
firebase.initializeApp(firebaseConfig);
firebase.analytics();
var arrReaderId = [];
var arrData = [];
firebase.database().ref().on('value', function (snapshot_outer)
{
    var Key = "";
    snapshot_outer.forEach(function (childSnapshot_outer)
    {
        var Data = "";
        var DataSet = new Set();
        Key = childSnapshot_outer.key;
        arrReaderId.push(Key);

        firebase.database().ref(Key).on('value', function (snapshot_inner)
        {

            snapshot_inner.forEach(function (childSnapshot_inner)
            {
                var strdata = childSnapshot_inner.val().toString();
                var dump = strdata.toString();
                DataSet.add(dump.substr(0, 6));
            });
        });
        var arr = [...DataSet];
        Data = arr.toString();
        arrData.push(Data);
    });
});
```

## Smart Library Shelf Management System

### ➤ Misplaced Book Script

```
var floorid;
setTimeout(delayExecution, 2000);
function delayExecution()
{
$(document).ready(function ()
{
for (var i = 0; i < buttoncounter; i++)
{
var id = "button" + i;
$("#" + id).click(function ()
{
floorid = $(this).val();
$("#maincontainer").find("#shelfcontainer").remove();
$("#shelftitle").remove();
$.ajax
(
{
url:
'http://localhost:8080/SmartLibraryShelfManagement/MisplacedBookReportFloorwise',
type: 'POST',
data: {"arrReaderId[]": arrReaderId, "arrData[]": arrData, floorid: floorid},
success: function (data1)
{
if (data1.length > 0)
{
var html = "";
html += '<h2 class="section-title" id="shelftitle">Book Report</h2><form
method="POST"><div class="row" id="shelfcontainer"> <div class="col-xl-12 col-sm-8
offset-sm-2 col-md-6 offset-md-3 col-lg-6 offset-lg-10 col-xl-4 offset-xl-0"> <div
class="card card-primary"> <div class="card-body"> <div id="shelf"> </div><div
id="btn_submit"> <button class="btn btn-primary" id="btn_submit_report">Show Full
Report</button></div></div></div></div></form>';

```

## Smart Library Shelf Management System

```
$("#maincontainer").append(html);
$("#shelf").append(data1);
} else
{
    alert("This floor has no shelf");}}});});
$(document).on("click", "#btn_submit_report", function ()
{
$(this).append("<input type='hidden' name='floorid' value='" + floorid + "'/>");
$(this).attr("formaction",
"http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalRe
ports/misplaced-book-report.html");
});});}
```

### 3.1.1.3 Assigned Reader to Shelf Procedure

```
CREATE DEFINER=`root`@`localhost` PROCEDURE
`pro_assignedReaderToShelf_slsms`()
BEGIN
    declare done int default 0;
    declare readerid varchar(10);
    declare shelftierid varchar(6);
    declare cursor1 cursor for select
tbl_rfid_reader_configuration_slsms.rfid_reader_uid from
tbl_rfid_reader_configuration_slsms where rfid_reader_uid not in(select
rfid_reader_Uid from tbl_shelftierconfiguration_slsms where rfid_reader_Uid is
not null) order by rfid_reader_uid;
    declare cursor2 cursor for select shelf_tier_id from
tbl_shelftierconfiguration_slsms where present_book is not null and
rfid_reader_Uid is null;
    declare continue handler for not found set done=1;
    open cursor1;
    open cursor2;
    label1:loop
        fetch cursor1 into readerid;
        fetch cursor2 into shelftierid;
        if done =1 then
```

## Smart Library Shelf Management System

```
leave label1;
end if;
update tbl_shelftierconfiguration_slsms set rfid_reader_Uid=readerid where
shelf_tier_id=shelftierid;
end loop label1;
close cursor1;
close cursor2;
END
```

### 3.1.1.4 Book Configuration on Shelf Procedure

```
CREATE DEFINER='root'@'localhost' PROCEDURE
`pro_bookconfigurationonshelf_slsms`(booklibid varchar(4),maxallowedbook
int,subsectionid tinyint,bookquantity smallint,flag varchar(10))
BEGIN
declare shelftierid tinyint;
declare readercount tinyint;
declare exist tinyint;
if flag="insert" then
call
pro_newbookconfiguration_slsms(booklibid,maxallowedbook,subsectionid,bookq
uantity);
elseif flag="update" then
call pro_updatebookconfiguration_slsms(booklibid,bookquantity);
end if;
select count(tbl_rfid_reader_configuration_slsms.rfid_reader_uid) into
readercount from tbl_rfid_reader_configuration_slsms where rfid_reader_uid not
in(select rfid_reader_Uid from tbl_shelftierconfiguration_slsms where
rfid_reader_Uid is not null);
select count(shelf_tier_id) into shelftierid from tbl_shelftierconfiguration_slsms
where present_book is not null and rfid_reader_Uid is null;
if readercount > 0 and shelftierid > 0 then
call pro_assignedReaderToShelf_slsms();
end if; END
```

## Smart Library Shelf Management System

### 3.1.1.5 New Book Configuration

```
CREATE DEFINER=`root`@`localhost` PROCEDURE
`pro_newbookconfiguration_slsms`(booklibid varchar(4),maxallowedbook
tinyint,subsectionid tinyint,bookquantity smallint)
BEGIN
declare done int default 0;
declare shelfid varchar(4);
declare shelftierid varchar(8);
declare total int;
declare firstcounter int default 0;
declare secondcounter int default 0;
declare bookconfigonshelf_data CURSOR for SELECT
tbl_shelftierconfiguration_slsms.shelf_id,shelf_tier_id from
tbl_shelftierconfiguration_slsms,tbl_shelfinfo_slsms where
tbl_shelfinfo_slsms.shelf_id=tbl_shelftierconfiguration_slsms.shelf_id and
sub_section_id=subsectionid and book_lib_id is null limit 2;
DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = 1;
open bookconfigonshelf_data;
set total=bookquantity;
label1:loop
fetch bookconfigonshelf_data into shelfid,shelftierid;
if done =1 then
leave label1;
end if;
update tbl_shelftierconfiguration_slsms set
book_lib_id=booklibid,max_allowed_book=maxallowedbook where
shelf_id=shelfid and shelf_tier_id=shelftierid;
if maxallowedbook >= bookquantity then
if firstcounter =0 then
update tbl_shelftierconfiguration_slsms set
present_book=bookquantity,start_bookid_range=concat(booklibid,LPAD(1,3,0
)),end_bookid_range=concat(booklibid,LPAD(bookquantity,3,0)) where
shelf_id=shelfid and shelf_tier_id=shelftierid;
set firstcounter=firstcounter+1;
set total=0;
```

## Smart Library Shelf Management System

```
end if;
else
if secondcounter=0 then
update tbl_shelftierconfiguration_slsms set
present_book=maxallowedbook,start_bookid_range=concat(booklibid,LPAD(1
,3,0)),end_bookid_range=concat(booklibid,LPAD(maxallowedbook,3,0))
where shelf_id=shelfid and shelf_tier_id=shelftierid;
set secondcounter=secondcounter+1;
set total=total-maxallowedbook;
else
if total >=maxallowedbook then
update tbl_shelftierconfiguration_slsms set
present_book=maxallowedbook,start_bookid_range=concat(booklibid,LPAD(
maxallowedbook+1,3,0)),end_bookid_range=concat(booklibid,LPAD(maxallo
wedbook*2,3,0)) where shelf_id=shelfid and shelf_tier_id=shelftierid;
set total=total-maxallowedbook;
else
update tbl_shelftierconfiguration_slsms set
present_book=total,start_bookid_range=concat(booklibid,LPAD(maxallowedb
ook+1,3,0)),end_bookid_range=concat(booklibid,LPAD(maxallowedbook+1+t
otal,3,0)) where shelf_id=shelfid and shelf_tier_id=shelftierid;
set total=total-maxallowedbook;
end if;
end if;
end if;
end loop label1;
close bookconfigonshelf_data;
if total > 0 and total != bookquantity then
insert into tbl_extraallbooksslots_slsms
values(booklibid,total,concat(booklibid,LPAD(bookquantity-
total+1,3,0)),concat(booklibid,LPAD(bookquantity,3,0)));
select "extraslots";
elseif total=bookquantity then
```

## Smart Library Shelf Management System

```
insert into tbl_notassignedbookslots_slsms  
values(booklibid,total,concat(booklibid,LPAD(1,3,0)),concat(booklibid,LPAD(  
total,3,0)));  
select "notassigned";  
end if;  
END
```

### 3.1.1.6 Update Book Configuration

```
CREATE DEFINER=`root`@`localhost` PROCEDURE  
`pro_updatebookconfiguration_slsms`(booklibid varchar(4),bookquantity  
smallint)  
BEGIN  
declare check_book_lib_id varchar(4);  
declare shelftierid varchar(6);  
declare maxallowedbook tinyint;  
declare presentbook tinyint;  
declare endbookidrange varchar(5);  
declare b_quantity smallint;  
declare total int;  
declare extrabooktotal tinyint default 0;  
declare done int default 0;  
declare bookconfigonshelf_data CURSOR for select  
shelf_tier_id,max_allowed_book,present_book,end_bookid_range from  
tbl_shelftierconfiguration_slsms where (max_allowed_book > present_book or  
present_book is null) and book_lib_id=booklibid;  
DECLARE CONTINUE HANDLER FOR NOT FOUND SET done = 1;  
select Book_lib_id into check_book_lib_id from  
tbl_notassignedbookslots_slsms where Book_lib_id=booklibid;  
if(check_book_lib_id is not null) then  
update tbl_notassignedbookslots_slsms set  
book_quantity=book_quantity+bookquantity,end_bookid_range=concat("B",su  
bstr(end_bookid_range,2)+bookquantity) where  
Book_lib_id=check_book_lib_id;  
else  
set b_quantity=bookquantity;
```

## Smart Library Shelf Management System

```
open bookconfigonshelf_data;
label1:loop
fetch bookconfigonshelf_data into
shelftierid,maxallowedbook,presentbook,endbookidrange;
if done =1 then
leave label1;
end if;
if presentbook is not null then
set total =maxallowedbook-presentbook;
set bookquantity=bookquantity-total;
if bookquantity > 0 then
update tbl_shelftierconfiguration_slsms set
present_book=present_book+total,end_bookid_range=concat(booklibid,LPAD(
substr(end_bookid_range,3)+total,3,0)) where shelf_tier_id=shelftierid;
set extrabooktotal=bookquantity;
else
update tbl_shelftierconfiguration_slsms set
present_book=present_book+b_quantity,end_bookid_range=concat(booklibid,
LPAD((substr(end_bookid_range,3)+b_quantity),3,0)) where
shelf_tier_id=shelftierid;
leave label1;
end if;
else
if maxallowedbook >= bookquantity then
update tbl_shelftierconfiguration_slsms set
present_book=bookquantity,start_bookid_range=concat(booklibid,LPAD(max
allowedbook+1,3,0)),end_bookid_range=concat(booklibid,LPAD(maxallowedb
ook+bookquantity,3,0)) where shelf_tier_id=shelftierid;
else
set extrabooktotal=bookquantity-maxallowedbook;
update tbl_shelftierconfiguration_slsms set
present_book=maxallowedbook,start_bookid_range=concat(booklibid,LPAD(
maxallowedbook+1,3,0)),end_bookid_range=concat(booklibid,LPAD(maxallo
wedbook*2,3,0)) where shelf_tier_id=shelftierid;
end if;
```

## Smart Library Shelf Management System

```
end if;
end loop label1;
close bookconfigonshelf_data;
select Book_lib_id into check_book_lib_id from tbl_extraallbookslots_slsms
where Book_lib_id=booklibid;
if check_book_lib_id is not null then
update tbl_extraallbookslots_slsms set
book_quantity=book_quantity+bookquantity,end_bookid_range=concat(bookl
ibid,(substr(end_bookid_range,3)+bookquantity)) where
Book_lib_id=check_book_lib_id;
end if;
if extrabooktotal > 0 then
insert into tbl_extraallbookslots_slsms
values(booklibid,extrabooktotal,concat(booklibid,LPAD(maxallowedbook*2+
1,3,0)),concat(booklibid,LPAD((maxallowedbook*2)+extrabooktotal,3,0)));
end if;
end if;
END
```

### 3.1.1.7 Book Detail Report

```
CREATE DEFINER=`root`@`localhost` PROCEDURE
`pro_bookdetailReport_slsms`(bookid varchar(4),flag tinyint)
BEGIN
declare flagextra int;
declare flagnotassigned int;
declare flagtierinfo int;
select book_title,sub_section_type,main_section_type from
tbl_shelfmainsection_master_slsms,tbl_shelfsubsection_slsms,tbl_bookinfo_ma
ster_slsms where
tbl_shelfmainsection_master_slsms.main_section_id=tbl_shelfsubsection_slsms
.main_section_id and tbl_shelfsubsection_slsms.sub_section_id=
tbl_bookinfo_master_slsms.book_sub_section_id and Book_lib_id=bookid;

select exists(select book_lib_id from tbl_shelftierconfiguration_slsms where
book_lib_id=bookid) into flagtierinfo;
```

## Smart Library Shelf Management System

```
select exists(select * from tbl_extraallbookslots_slsms where
Book_lib_id=bookid) into flagextra;
select exists(select * from tbl_notassignedbookslots_slsms where
Book_lib_id=bookid) into flagnotassigned;

if flag=1 then
if flagtierinfo = 1 then
select tbl_shelftierconfiguration_slsms.* , floor_id from
tbl_shelfinfo_slsms,tbl_shelftierconfiguration_slsms where
tbl_shelfinfo_slsms.shelf_id=tbl_shelftierconfiguration_slsms.shelf_id and
book_lib_id=bookid;
end if;
end if;

if flagextra = 1 then
select "Extra Book
details",book_quantity,start_bookid_range,end_bookid_range from
tbl_extraallbookslots_slsms where Book_lib_id=bookid;
elseif flagnotassigned = 1 then
select "Un-Allocated Book
Details",book_quantity,start_bookid_range,end_bookid_range from
tbl_notassignedbookslots_slsms where Book_lib_id=bookid;
end if;

END
```

### 3.1.2 Coding Convention

#### 1. Variables

- a. A variable name must specify the information of the content. For example, the institute\_id specifies that this ID is of the institute.
- b. A constant variable must be declared in uppercase only. For Example, const int SEMESTER;
- c. Variable names other than constants should be in small cases only. For Example, institute\_id, institute\_name.

#### 2. Class name must have first letter capital and should be in 'StudyCaps' format. For Example, StudentResult.

#### 3. Methods of the class must be in 'camelCase'.

#### 4. Each package should have a top-level package.

#### 5. Each package can have many sub packages as required.

#### 6. Place all the comments after the end of line of code not on the same line.

#### 7. When coding Java classes and interfaces, the following formatting rules should be followed:

- a. No space between a method name and the parenthesis "(" starting its parameter list
- b. Open brace "{" appears at the end of the same line as the declaration statement
- c. Closing brace "}" starts a line by itself indented to match its corresponding opening statement "{", except when it is a null statement the "}" should appear immediately after the "{".

#### 8. Naming Convention of tables: -

- a. The master table name must follow the given convention 'tbl\_informationoftable\_master\_shortformofsystemname'
- b. For Example, if the table is for storing the information of book then table name should be 'tbl\_bookinformation\_master\_slsms'.
- c. The child table name must follow the given convention 'tbl\_informationoftable\_shortformofsystemname'.
- d. For Example, if the table is for storing the rfid tag information of book then table name should be 'tbl\_bookrfid\_slsms'.

### 3.1.3 General Framework Structure

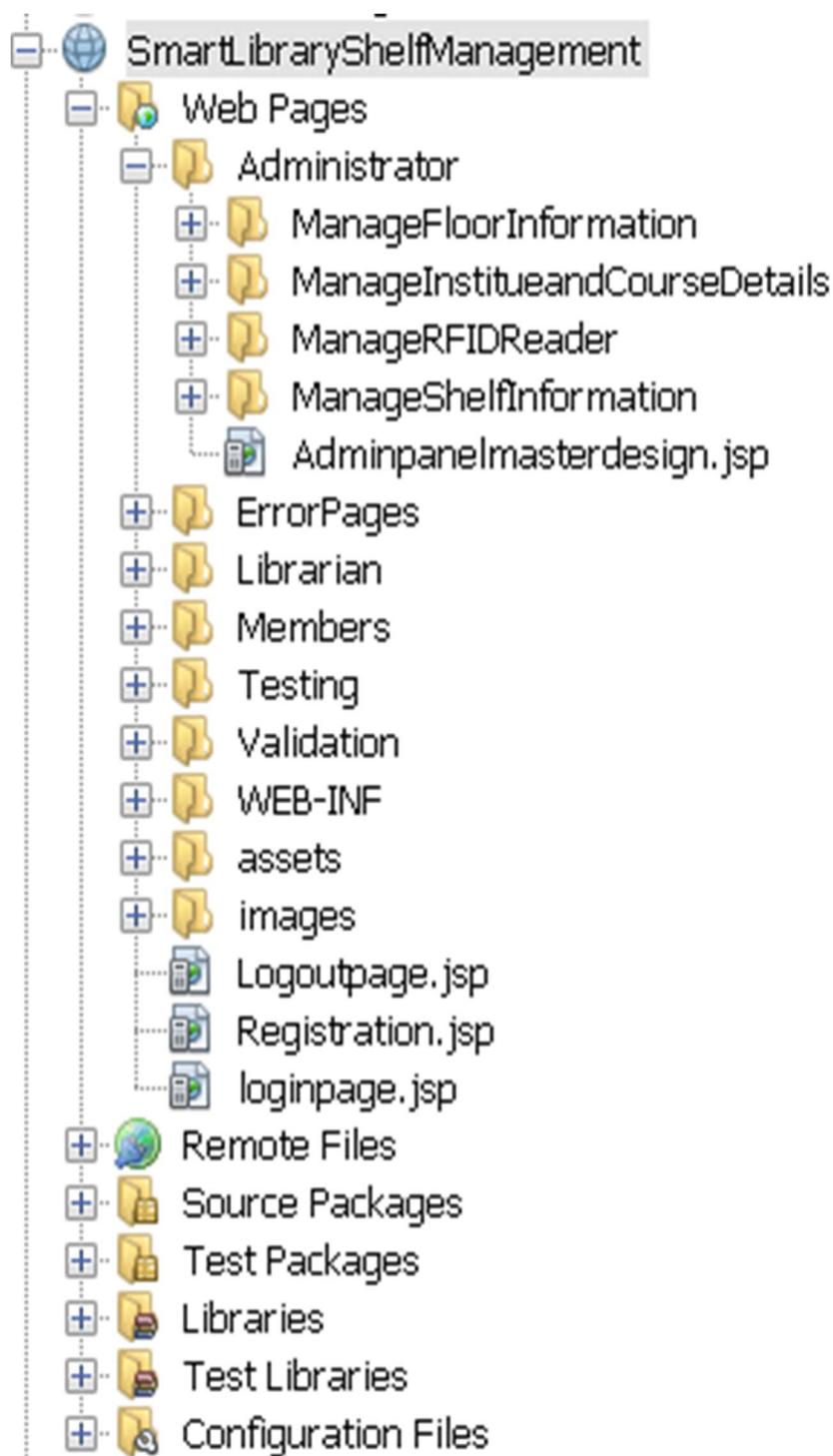
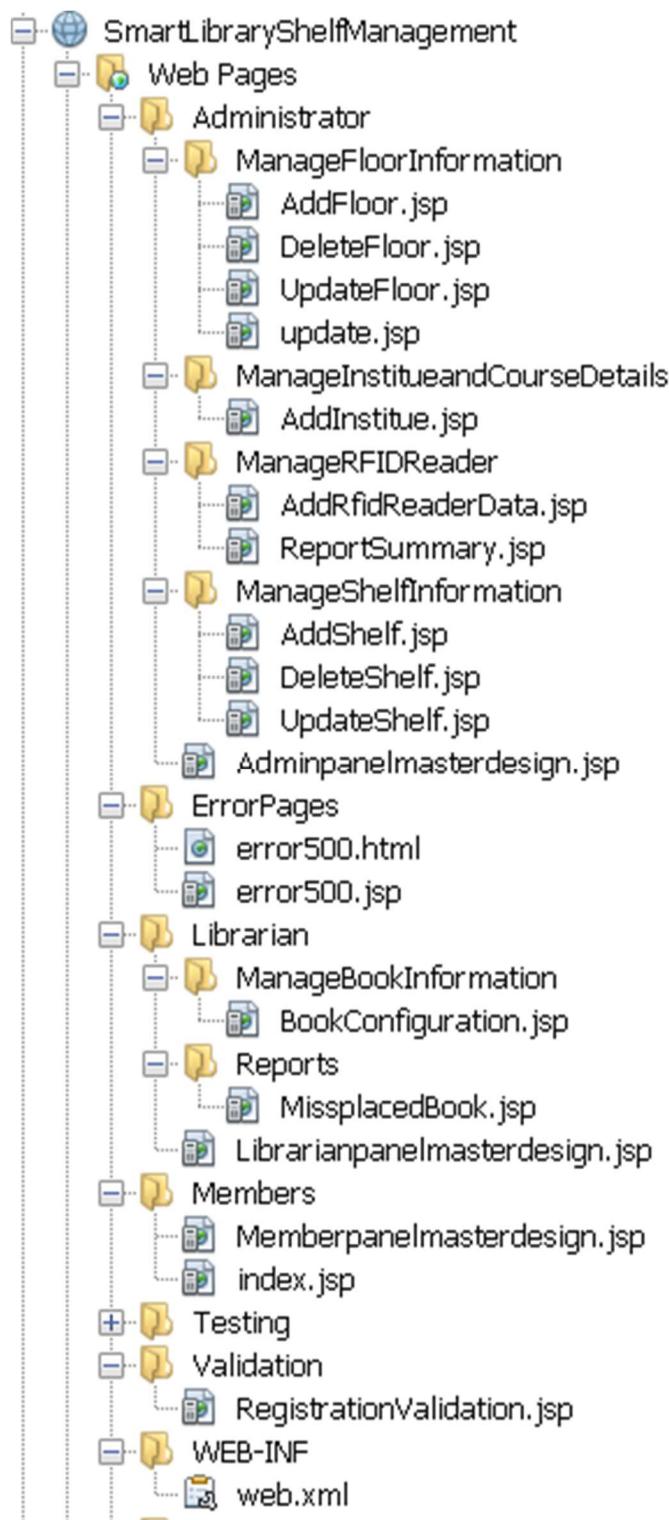
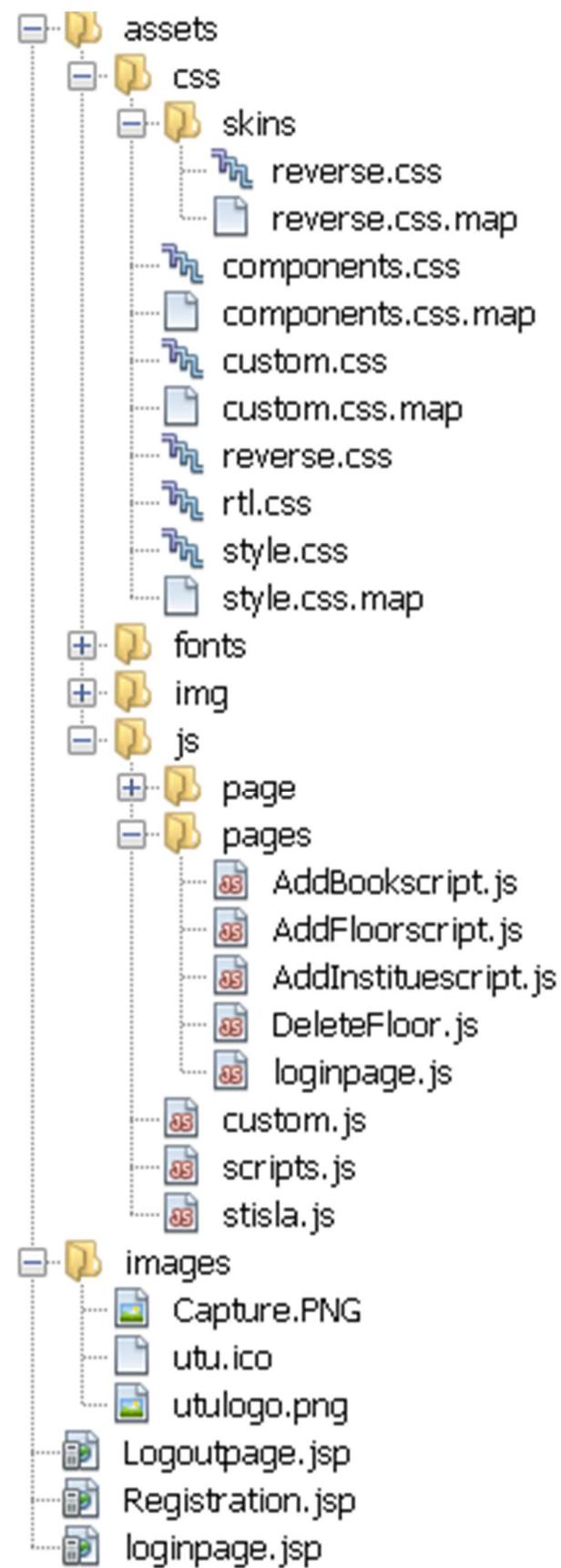


Figure 3.1 General Framework structure

### 3.1.4 Development-File Structure for standard application:



## Smart Library Shelf Management System



## Smart Library Shelf Management System

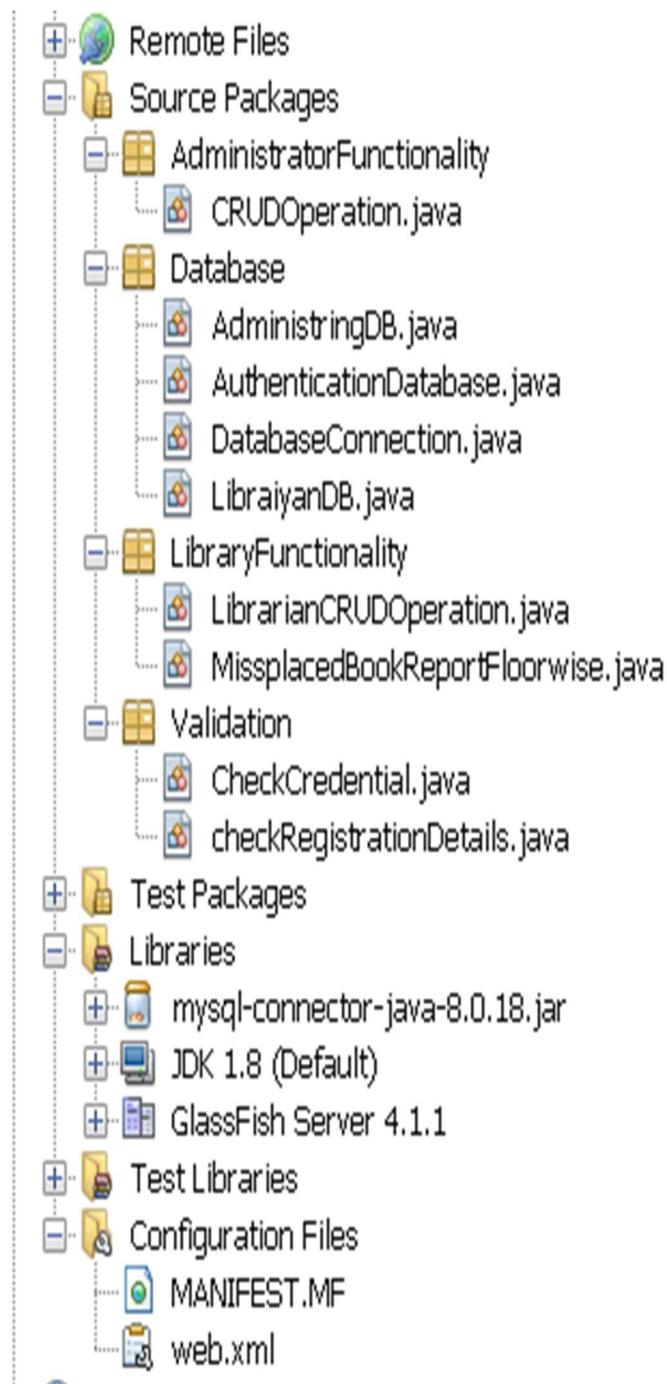


Figure 3.2 File Structure

## **3.2 External libraries**

### **3.2.1 NetBeans IDE Libraries**

<b>Sr. No</b>	<b>Library Name</b>	<b>Version</b>	<b>Description</b>
1.	MySQL Connector/J	8.0.19	MySQL provides connectivity for client applications developed in the Java programming language with MySQL Connector/J, a driver that implements the Java Database Connectivity (JDBC) API. MySQL Connector/J is a JDBC Type 4 driver.
2.	Stackpath BootStrapCDN & JS	4.4.1	Bootstrap is the most popular HTML, CSS, and JavaScript framework for developing responsive, mobile-first websites.
3.	Google Visualization API	Charts Version 48	The Google Visualization API allows you to create charts and reporting applications over structured data and helps integrate these directly into your website.
4.	Font Awesome Icons	5.7.2	It provides icon set and toolkit.
5.	CloudFlare DataTable CDN (CSS & JS)	1.10.20	DataTables is a plug-in for the jQuery JavaScript library. It is a highly flexible tool, built upon the foundations of progressive enhancement, that adds all of these advanced features to any HTML table.
6.	JavaMail	1.6.2	The JavaMail is an API that is used to compose, write and read electronic messages (emails). The JavaMail API provides protocol-independent and platform-independent framework for sending and receiving mails.
7.	Firebase JavaScript CDN	7.14.5	Firebase App (the core Firebase SDK)

## Smart Library Shelf Management System

8.	Firebase JavaScript CDN- Firebase- database	7.14.5	For Accessing Firebase Realtime Database Data.
----	--	--------	--

Table 3.1 NetBeans IDE Libraries list

### 3.2.2 Arduino IDE

Sr. No	Library Name	Version	Description
1.	Servo	1.1.5	This library can control servo motor. Its method is useful to rotate servo motor in any direction.
2.	MFRC522	1.4.6	Read/Write a RFID Card or Tag using the ISO/IEC 14443A/MIFARE interface.
3.	ESP8266wifi	0.9.2.4	Configuration of WI-FI.
4.	Firebase Arduino	5.13.1	To Connect with Google Firebase Cloud.
5.	SPI	1.2.3	Serial Peripheral Interface (SPI) is a synchronous serial data protocol used by microcontrollers for communicating with one or more peripheral devices quickly over short distances. It can also be used for communication between two microcontrollers

Table 3.2 Arduino IDE Libraries list

### **3.3 Summary**

#### **3.3.1 Web Pages**

<b>Sr. No</b>	<b>Actual URL</b>	<b>Rewritable URL</b>	<b>Line of Code</b>
1.	http://localhost:8080/SmartLibraryShelfManagement/Loginpage.jsp	http://localhost:8080/SmartLibraryShelfManagement/ login.html	116
2.	http://localhost:8080/SmartLibraryShelfManagement/Registration.jsp	http://localhost:8080/SmartLibraryShelfManagement/ registration.html	176
3.	http://localhost:8080/SmartLibraryShelfManagement /Logoutpage.jsp	http://localhost:8080/SmartLibraryShelfManagement /logoutpage.html	98
4.	http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageFloorInformation /AddFloor.jsp	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageFloorInformation/floor-add.html	271
5.	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageFloorInformation/UpdateFloor.jsp	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageFloorInformation/Floor-Update.html	141
6.	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageFloorInformation/DeleteFloor.jsp	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageFloorInformation/floor-delete.html	106
7.	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageShelfInformation/AddShelf.jsp	http://localhost:8080/SmartLibraryShelfManagement /Administrator/ManageShelfInformation/shelf-tier- configuration.html	196

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8.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstitueandCourseDetails/Add_UpdateInstitute.jsp">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstitueandCourseDetails/Add_UpdateInstitute.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstitueandCourseDetails/manage-institute-course.html">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstitueandCourseDetails/manage-institute-course.html</a>	55
9.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/AddRfidReaderData.jsp">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/AddRfidReaderData.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/add-reader.html">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/add-reader.html</a>	56
10.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/Adminpanelmasterdesign.jsp">http://localhost:8080/SmartLibraryShelfManagement/Administrator/Adminpanelmasterdesign.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Adminpanelmasterdesign.html">http://localhost:8080/SmartLibraryShelfManagement/Adminpanelmasterdesign.html</a>	187
11.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageUsers/ManageLibrarian.jsp">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageUsers/ManageLibrarian.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageUsers/manage-librarian.html">http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageUsers/manage-librarian.html</a>	122
12.	<a href="http://localhost:8080/SmartLibraryShelfManagement/ErrorPages/error403.html">SmartLibraryShelfManagement/ErrorPages/error403.html</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/error403.html">SmartLibraryShelfManagement/error403.html</a>	55
13.	<a href="http://localhost:8080/SmartLibraryShelfManagement/ErrorPages/error404.html">SmartLibraryShelfManagement/ErrorPages/error404.html</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/error404.html">SmartLibraryShelfManagement/error404.html</a>	55
14.	<a href="http://localhost:8080/SmartLibraryShelfManagement/ErrorPages/error500.html">SmartLibraryShelfManagement/ErrorPages/error500.html</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/error500.html">SmartLibraryShelfManagement/error500.html</a>	55
15.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/BookConfiguration.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/BookConfiguration.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/book-configuration.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/book-configuration.html</a>	118
16.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/MisplacedBook.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/MisplacedBook.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplaced-book.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplaced-book.html</a>	130

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17.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplacedbookreport.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplacedbookreport.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplaced-book-report.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/GraphicalReports/misplaced-book-report.html</a>	117
18.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/BookReportSummary.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/BookReportSummary.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/book-report-summary.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/book-report-summary.html</a>	244
19.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/ExtraBookSlotReport.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/ExtraBookSlotReport.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/extra-book-slot-report.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/extra-book-slot-report.html</a>	77
20.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/NewlyConfiguredBookReport.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/NewlyConfiguredBookReport.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/new-configured-book-reports.html">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Reports/StatisticalReports/new-configured-book-reports.html</a>	102
21.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/LibrarianDashboard.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/LibrarianDashboard.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/librariandashboard.html">http://localhost:8080/SmartLibraryShelfManagement/librariandashboard.html</a>	349
22.	<a href="http://localhost:8080/SmartLibraryShelfManagement/Librarian/Librarianpanelmasterdesign.jsp">http://localhost:8080/SmartLibraryShelfManagement/Librarian/Librarianpanelmasterdesign.jsp</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement/librarianpanelmasterdesign.html">http://localhost:8080/SmartLibraryShelfManagement/librarianpanelmasterdesign.html</a>	170
23.	<a href="http://localhost:8080/SmartLibraryShelfManagement">http://localhost:8080/SmartLibraryShelfManagement</a>	<a href="http://localhost:8080/SmartLibraryShelfManagement">http://localhost:8080/SmartLibraryShelfManagement</a>	136

## Smart Library Shelf Management System

	/raryShelfManagement /Members/Memberfunctionality /searchbook.jsp	/raryShelfManagement /Members/Memberfunctionality /search-book.html	
24.	http://localhost:8080/SmartLibraryShelfManagement /Members/Report/LibraryBook Map.jsp	http://localhost:8080/SmartLibraryShelfManagement /Members/Report/library-book- map.html	302
25.	http://localhost:8080/SmartLibraryShelfManagement /Members/Memberpanelmaster design.jsp	http://localhost:8080/SmartLibraryShelfManagement /Members/memberpanelmaster design.html	113
<b>Total</b>			<b>3547</b>

Table 3.3 Summary of webpages.

### 3.3.2 JavaScript

Sr. No	Page Name	Line of Code
1.	AddBookscript.js	193
2.	AddFloorscript.js	80
3.	AddInstitutescript.js	108
4.	Addtieronshelf.js	23
5.	DeleteFloor.js	12
6.	ExtraBookslostsript.js	25
7.	Firebasecript.js	44
8.	LibrarianChartCategoryWiseBookscript.js	20
9.	LibrarianDeshboardscript.js	99
10.	ManageLibrarianscript.js	186
11.	MisplacedBookscript.js	52
12.	UpdateFloorscript.js	434
13.	Loginpage.js	47
<b>Total</b>		<b>1323</b>

Table 3.4 Summary of JavaScript pages

## Smart Library Shelf Management System

### 3.3.3 Servlet

Sr. No	Package Name	Servlet Name	Line of Code
1.	Database	CRUDOperation.java	522
2.		AdminstringDB.java	461
3.		AuthenticationDatabase.java	97
4.		DatabaseConnection.java	29
5.		LibrarianDB.java	260
6.		MemeberDB.java	238
7.	LibrarianFunctionality	LibrarianCRUDOperation.java	131
8.		LibrarianReports.java	30
9.		MisplacedBookReportFloorwise.java	117
10.	Mail	Mailer.java	58
11.	MemeberOperation	BooksearchOperation.java	70
12.	Validation	CheckCredential.java	176
13.		CheckRegistrationDetails.java	92
<b>Total</b>			<b>2281</b>

Table 3.5 Summary of Servlet Pages

### 3.3.4 Arduino IDE Code (IoT)

Sr. No	Page Name	Line of Code
1.	Arduino_To_ServoMotor.ino	15
2.	NodeMCU_To_Firebase	94
<b>Total</b>		<b>109</b>

Table 3.6 Summary of IoT code.

# Chapter 4 Reports

## 4.1 Dashboard

### 4.1.1 Administrator Dashboard

#### 4.1.1.1 Screenshot

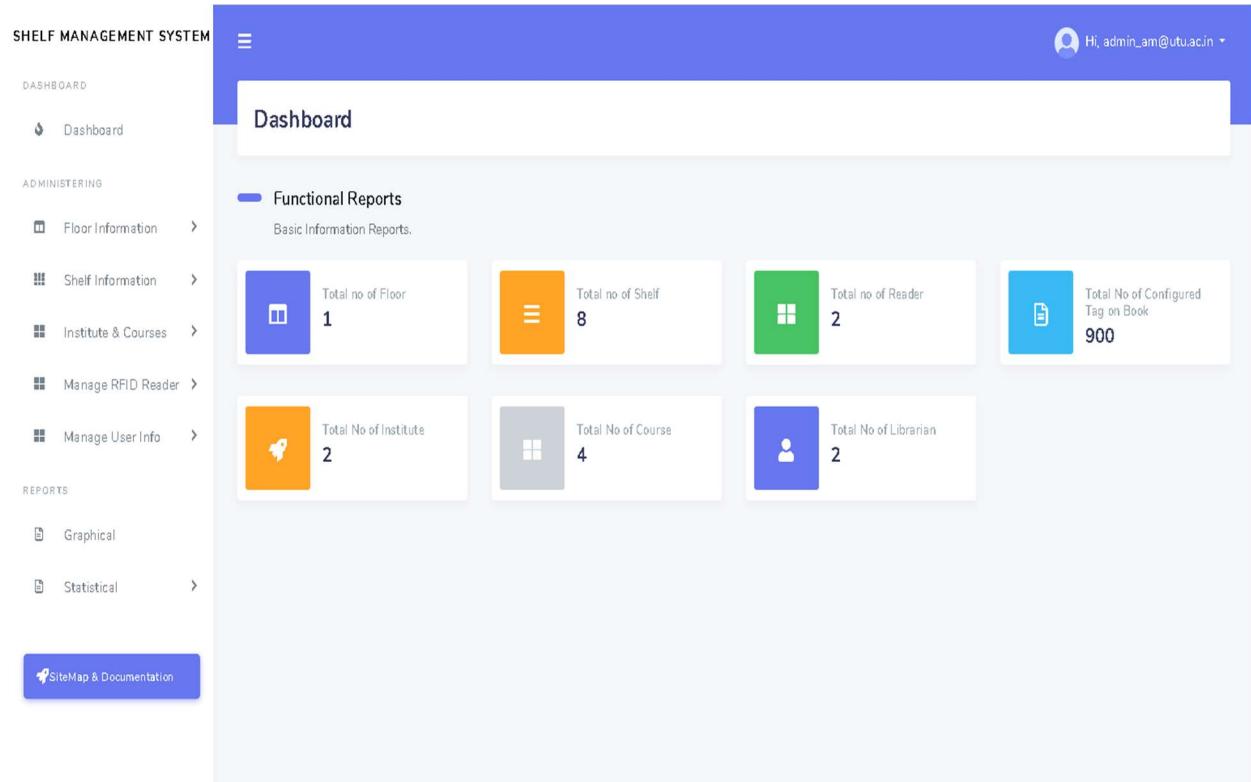


Figure 4.1 Administrator Dashboard

#### 4.1.1.2 Description

<b>View-1 Name</b>	<b>Total No of Floor</b>
Description	Display the count of Total number of Floor.
Data From	tbl_floorinfo_master_slsms
Data To	-
<b>View-2 Name</b>	<b>Total No of Shelf</b>
Description	Display the total number of shelves in library.
Data From	tbl_shelfinfo_slsms
Data To	-
<b>View-3 Name</b>	<b>Total No of Reader</b>

## Smart Library Shelf Management System

Description	Display the total number of configured readers in library.
Data From	tbl_rfid_reader_configuration_slsms
Data To	-
<b>View-4 Name</b>	<b>Total No of Configured Tag on Book</b>
Description	Display the total number of books that having RFID Tags on it.
Data From	tbl_bookconfiguration_slsms
Data To	-
<b>View-5 Name</b>	<b>Total No of Institute</b>
Description	Display the total number of registered institutes.
Data From	tbl_instituteinfo_master_slsms
Data To	-
<b>View-6 Name</b>	<b>Total No of Course</b>
Description	Display the total number of courses in collage/university
Data From	tbl_coursedetails_slsms
Data To	-
<b>View-7 Name</b>	<b>Total No of Librarian</b>
Description	Display the total number of librarians in library.
Data From	tbl_nativeuserinfo_master_slsms
Data To	-

Table 4.1 Administrator Dashboard Description

# Smart Library Shelf Management System

## 4.1.2 Librarian Dashboard

### 4.1.2.1 Screenshot

The screenshot shows the Librarian Dashboard with a blue header bar. On the right, a user profile icon says "Hi, librarian\_lb2@utu.ac.in". The left sidebar has sections for DASHBOARD, MANAGE (Book Information, Graphical, Statistical), and REPORTS (SiteMap & Documentation). The main area is titled "Dashboard" and contains two sections: "Functional Reports" and "Periodic Reports". "Functional Reports" includes four cards: "Total no of Books" (900), "Total no of Registered Student" (2), "Total no of Registered Faculty" (0), and "Total no of book category" (20). "Periodic Reports" includes three cards: "No Of unassigned books on shelves" (0), "Newly Configured Book" (3), and "Misplaced Book Reports" (3). Each card has an icon and a numerical value.

Figure 4.2 Librarian Dashboard- Functional & Periodic View

The screenshot shows the Librarian Dashboard with a blue header bar. On the right, a user profile icon says "Hi, librarian\_lb2@utu.ac.in". The left sidebar has sections for DASHBOARD, MANAGE (Book Information, Graphical, Statistical), and REPORTS (SiteMap & Documentation). The main area is titled "Tabular Reports" under "Advanced Reports". It shows a "Book Details" table with three entries:

Sr.no	Book Id	Book Name	Floor No	Shelf No	No Of tier	Category	Total Books	More Info
1	B1	javascript	1	S101	4	Programming Language	400	<a href="#">More Information</a>
2	B2	java	1	S101	4	Programming Language	100	<a href="#">More Information</a>
3	B3	python	1	S102	2	Programming Language	400	<a href="#">More Information</a>

Below the table, it says "Showing 1 to 3 of 3 entries" and has "Previous" and "Next" buttons. The "Chart Reports" section is also visible below the table.

Figure 4.3 Librarian Dashboard- Tabular View

# Smart Library Shelf Management System

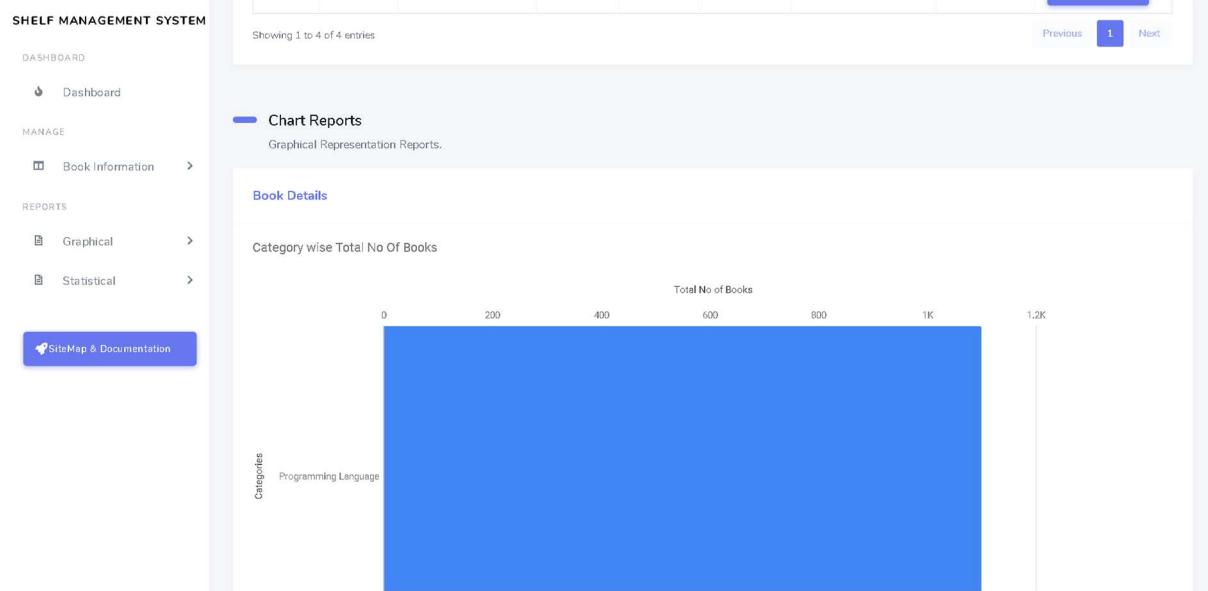


Figure 4.4 Librarian Dashboard- Chart View

### 4.1.2.2 Description

<b>View-1 Name</b>	<b>Total No of Configured Book</b>
Description	Display the count of Total number of configured books in library.
Data From	tbl_bookconfiguration_slsms
Data To	-
<b>View-2 Name</b>	<b>Total No of Registered Students</b>
Description	Display the total number of registered students in library.
Data From	tbl_studentregistered_slsms
Data To	-
<b>View-3 Name</b>	<b>Total No of Registered Faculty</b>
Description	Display the total number of registered faculty in library.
Data From	tbl_facultyinfo_master_slsms
Data To	-
<b>View-4 Name</b>	<b>Total No of Configured Tag on Book</b>

## Smart Library Shelf Management System

<b>Description</b>	Display the total number of books that having RFID Tags on it.
<b>Data From</b>	tbl_bookconfiguration_slsms
<b>Data To</b>	-
<b>View-5 Name</b>	<b>Total No of Book Categories</b>
<b>Description</b>	Display the total number of book categories present in library.
<b>Data From</b>	tbl_shelfsubsection_slsms
<b>Data To</b>	-
<b>View-6 Name</b>	<b>No of Unassigned book on shelf</b>
<b>Description</b>	Display the total number of books that are not assigned.
<b>Data From</b>	tbl_notassignedbookslots_slsms
<b>Data To</b>	-
<b>View-7 Name</b>	<b>Total No of Newly configured books</b>
<b>Description</b>	Display the total number of books that are recently configured on shelf.
<b>Data From</b>	tbl_configuredbookreport_slsms
<b>Data To</b>	-
<b>View-8 Name</b>	<b>Total No of Books in extra slots (In warehouse)</b>
<b>Description</b>	Display the total number of book title that extra books in the warehouse.
<b>Data From</b>	tbl_configuredbookreport_slsms
<b>Data To</b>	-
<b>View-9 Name</b>	<b>Tabular View</b>
<b>Description</b>	Display the details of the all configured book on shelves.
<b>Data From</b>	tbl_bookinfo_master_slsms,   tbl_bookconfiguration_slsms, tbl_shelfsubsection_slsms,                           tbl_shelfinfo_slsms, tbl_shelftierconfiguration_slsms
<b>Data To</b>	-
<b>View-10 Name</b>	<b>Chart View</b>

## Smart Library Shelf Management System

Description	Display the graphical representation of total number of the book categories.
Data From	tbl_shelfsubsection_slsms,   tbl_bookinfo_master_slsms, tbl_bookconfiguration_slsms, Google Chart API
Data To	-

Table 4.2 Librarian Dashboard Description

# Smart Library Shelf Management System

## 4.2 User Reports

### 4.2.1 Misplaced Book Report

#### Screenshots

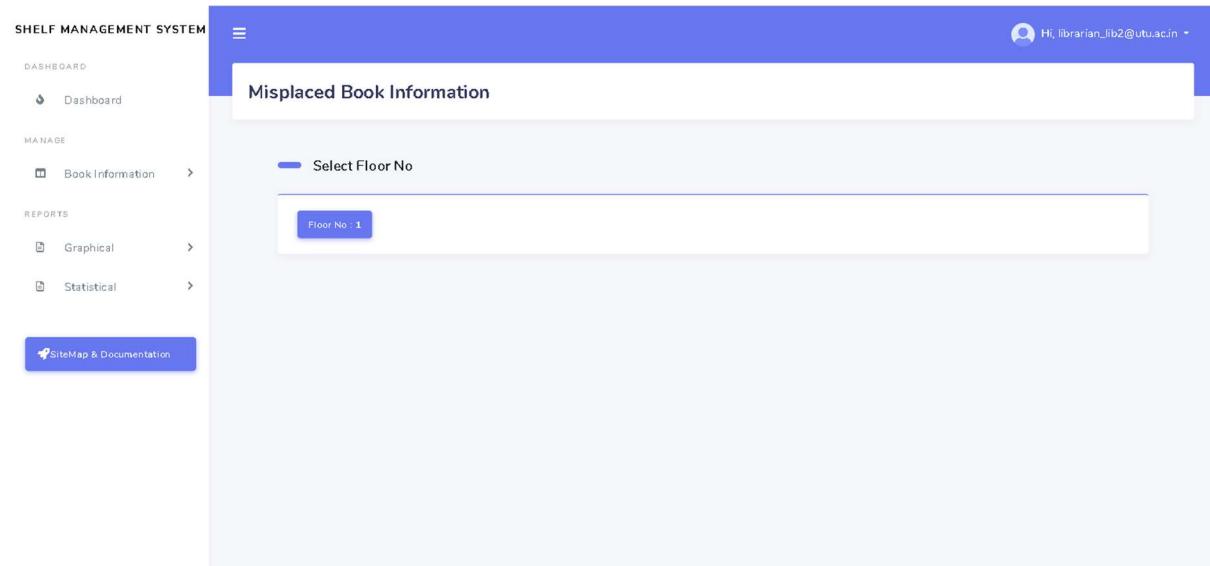


Figure 4.5 Misplaced Book Reports – Select Floor No.

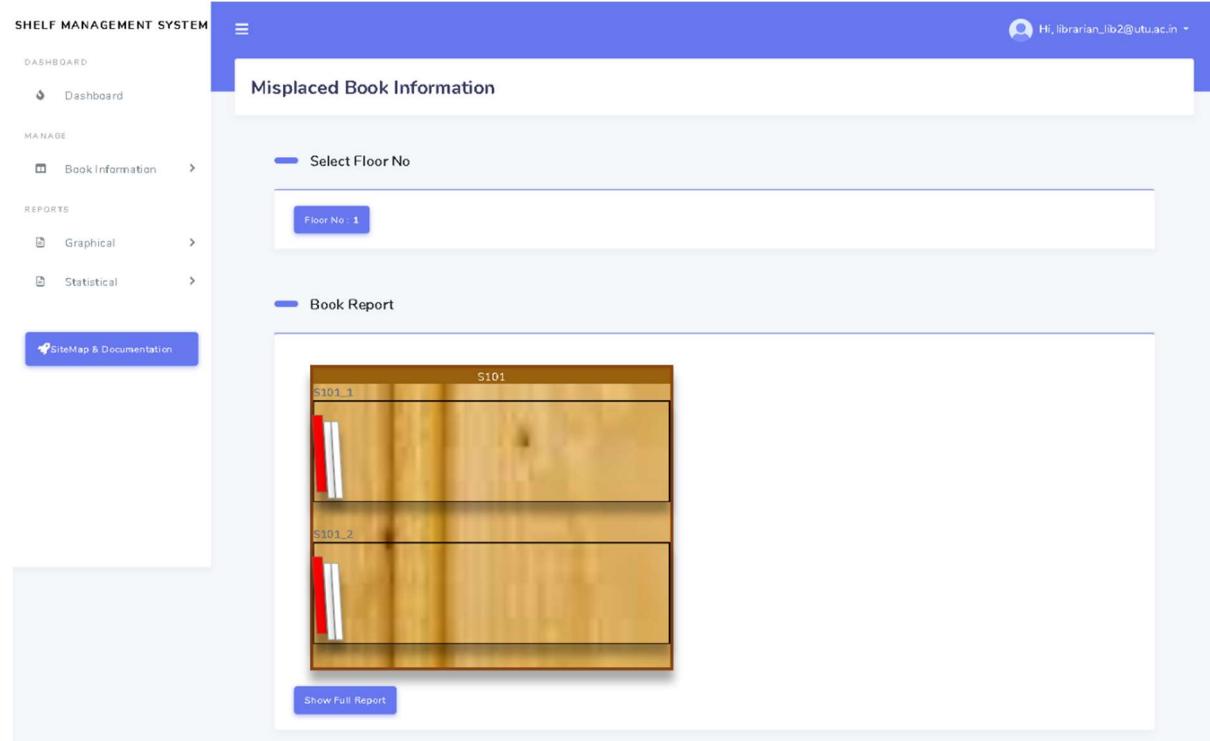


Figure 4.6 Misplaced Book Reports – Display Shelf & Books. Red Book Denoted wrong place of book.

## Smart Library Shelf Management System

The screenshot shows a report titled "REPORT SUMMARY OF FLOOR NO:-1". At the top, there is a logo for "UKA TARSADIA UNIVERSITY" featuring a stylized flame. Below the title, there are search and filter options: "Show 10 entries" and "Search: [ ]". A table displays the following data:

Sr.no	ShelfId	Shelf tier Id	Book Id	Position	Origin Floor No	Origin Shelf Id	Origin Shelf Tier Id
1	S101	S101_1	B2	1	1	S101	S101_3
2	S101	S101_2	B2	1	1	S101	S101_3

At the bottom, it says "Showing 1 to 2 of 2 entries" and has navigation buttons: "Previous" (disabled), "1", and "Next".

Figure 4.7 Misplaced Book Reports – Display adjacent location of misplaced book in tabular format.

### Description

Description	Filtered Report
Input Fields	Select Floor No
Name of User interface	Misplaced Book Information, Report Summary
Used Relations	tbl_shelftierconfiguration_slsms, tbl_shelfinfo_slsms
Output Fields	Misplaced book on the tiers
Usage	It will display the misplaced book. Help Librarian to re-arranged the misplaced book with the help of both graphical & statistical format.
User	Librarian

Table 4.3 Misplaced Book Report Description

## Smart Library Shelf Management System

### 4.2.2 Newly Configured Book Report

#### Screenshots

The screenshot shows a web-based library management system interface. On the left, a sidebar menu includes 'Dashboard', 'Book Information', 'Graphical Reports', 'Statistical Reports', and a blue-highlighted 'SiteMap & Documentation' button. The main content area has a blue header bar with the title 'Newly Configured Books'. Below it is a table with four entries. The table columns are 'Sr.no', 'BookId', 'BookName', 'TimeStamp', and 'Print'. Each row contains a 'Print' button. At the bottom of the table, there is a message 'Showing 1 to 4 of 4 entries' and a navigation bar with 'Previous', a page number '1', and 'Next'.

Sr.no	BookId	BookName	TimeStamp	Print
1	B1	javascript	2020-04-15 14:33:14	
1	B2	java	2020-04-15 12:09:07	
1	B3	python	2020-04-15 14:42:00	
1	B4	Big Data and Analytics	2020-05-28 11:54:50	

Figure 4.8 Newly Configured Book Reports.

The screenshot displays a 'REPORT SUMMARY' page. At the top, there is a logo for 'UKA TARSADIA' with the text 'University'. Below the logo, the title 'REPORT SUMMARY' is centered. The page contains several tables and sections of text. One table shows book details like Book ID (B4), Book Title (Big Data and Analytics), Main Section Type (Non-Fiction), Sub Section Type (Programming Language), and Floor No (1). Another section shows shelf details for Shelf Id S103, including Shelf tier Id (S103\_1) and Max allowed Book on this tier (35). A third section shows shelf details for Shelf Id S103, including Shelf tier Id (S103\_2) and Max allowed Book on this tier (35). At the bottom, there is a section for Extra Book details with Book Quantity (130), Start Book Id (B4001), End Book Id (B4035), and RFID Reader Id (~). A blue 'print' button is located at the bottom left. At the very bottom, there is a copyright notice: 'Copyright © UTU 2020'.

Figure 4.9 All the Detail of book.

## Smart Library Shelf Management System

### Description

Description	Filtered Report
Input Fields	Click on newly Configured Book.
Name of User interface	Newly Configured Book, Report Summary
Used Relations	tbl_shelfmainsection_master_slsms, tbl_shelfsubsection_slsms, tbl_bookinfo_master_slsms, tbl_shelfinfo_slsms, tbl_shelftierconfiguration_slsms, tbl_extraallbookslots_slsms, tbl_notassignedbookslots_slsms
Output Fields	Sr. No, Book Id, Book Name, Timestamp, Print.  After Clicking on print, Book id, Book title, Main Section type, Sub Section Type, Floor No, Shelf Id, Shelf Tier id, Max Allowed Book on tier, Total assigned book, start book id, End book id, RFID Reader id.
Usage	In this system book were assigned automatically on shelf.  At the time of adding book if shelf is not available then it will go to not assigned table that is in our case (at warehouse) once shelf is available system automatically assigned the book based on adding scheme, at that time librarian will notify by this report that is newly configured books.
User	Librarian

Table 4.4 Newly Configured Book Report Description

## Smart Library Shelf Management System

### 4.2.3 Extra Book Slot Reports

#### Screenshots

The screenshot shows a web-based library management system interface. On the left, a sidebar menu includes 'DASHBOARD', 'MANAGE' (with 'Book Information' selected), and 'REPORTS' (with 'Graphical' and 'Statistical' options). A blue button at the bottom of the sidebar says 'SiteMap & Documentation'. The main content area has a title 'Extra Book (At Warehouse Book)'. It features a table with columns: Sr.no, Book Id, Book Name, Book Quantity, and Print. The table contains four entries: B1 (javascript, 326), B2 (java, 6), B3 (python, 326), and B4 (Big Data and Analytics, 130). Each row has a 'Print' button. Navigation buttons for 'Previous', '1', and 'Next' are at the bottom.

Sr.no	Book Id	Book Name	Book Quantity	Print
1	B1	javascript	326	<button>Print</button>
1	B2	java	6	<button>Print</button>
1	B3	python	326	<button>Print</button>
1	B4	Big Data and Analytics	130	<button>Print</button>

Figure 4.10 Extra Book Slots Report

This screenshot shows a detailed view of extra book slot information. At the top, it says 'Extra Book details'. Below that is a table with five columns: Book Quantity (326), Start Book Id (B1075), and End Book Id (B1400). A blue 'print' button is located below the table. At the bottom, it says 'Copyright © UTU 2020'.

Book Quantity	Start Book Id	End Book Id
326	B1075	B1400

Figure 4.11 Extra Book Slot Details

## Smart Library Shelf Management System

### Description

Description	Filtered Report.
Input Fields	Click on Extra Book Slot Reports.
Name of User interface	Extra Book Slot Reports, Report Summary
Used Relations	tbl_extraallbookslots_slsms, tbl_notassignedbookslots_slsms
Output Fields	Sr. No, Book Id, Book Name, Book Quantity, Print.
Usage	In library there were hundreds of books of the same title so depends on the size of book system will decide how many books were reside on shelf and remaining books were go into extra book slot table so through this report librarian is able to see extra books.
User	Librarian

Table 4.5 Extra Book Slots Report Description

## Smart Library Shelf Management System

### 4.2.4 Book Details

#### Screenshot

Sr.no	Book Id	Book Name	Floor No	Shelf No	No Of tier	Category	Total Books	More Info
1	B1	javascript	1	S101	2	Programming Language	400	<button>More Information</button>
2	B2	java	1	S101	2	Programming Language	100	<button>More Information</button>
3	B3	python	1	S102	2	Programming Language	400	<button>More Information</button>
4	B4	Big Data and Analytics	1	S103	2	Programming Language	200	<button>More Information</button>

Showing 1 to 4 of 4 entries

Figure 4.12 All Book Details

#### Description

Description	General Report.
Input Fields	-
Name of User interface	Tabular View
Used Relations	tbl_bookinfo_master_slsms
Output Fields	Sr. No, Book Id, Book Name, Floor No, Shelf No, No of Tiers, Category, Total Books
Usage	Through this librarian can easily see all the book details also he/she can sort the tabular report like if he/she won't to see highest amount of book they he/she sort the reports. Keyword searching facilities are also available.
User	Librarian

Table 4.6 All Book Report Description

## Smart Library Shelf Management System

### 4.2.5 Total No of Book Category Wise (Bar chart View)

#### Screenshot



Figure 4.13 Category wise total no of Books.

#### Description

Description	General Report.
Input Fields	-
Name of User interface	Bar Chart View
Used Relations	tbl_bookinfo_master_slsms
Output Fields	Categories, Total No of books
Usage	It shows the total number of book category wise in graphical format.
User	Librarian

Table 4.7 Category wise total no of book report Description

## Smart Library Shelf Management System

### 4.2.6 Library Map Report

#### Screenshot

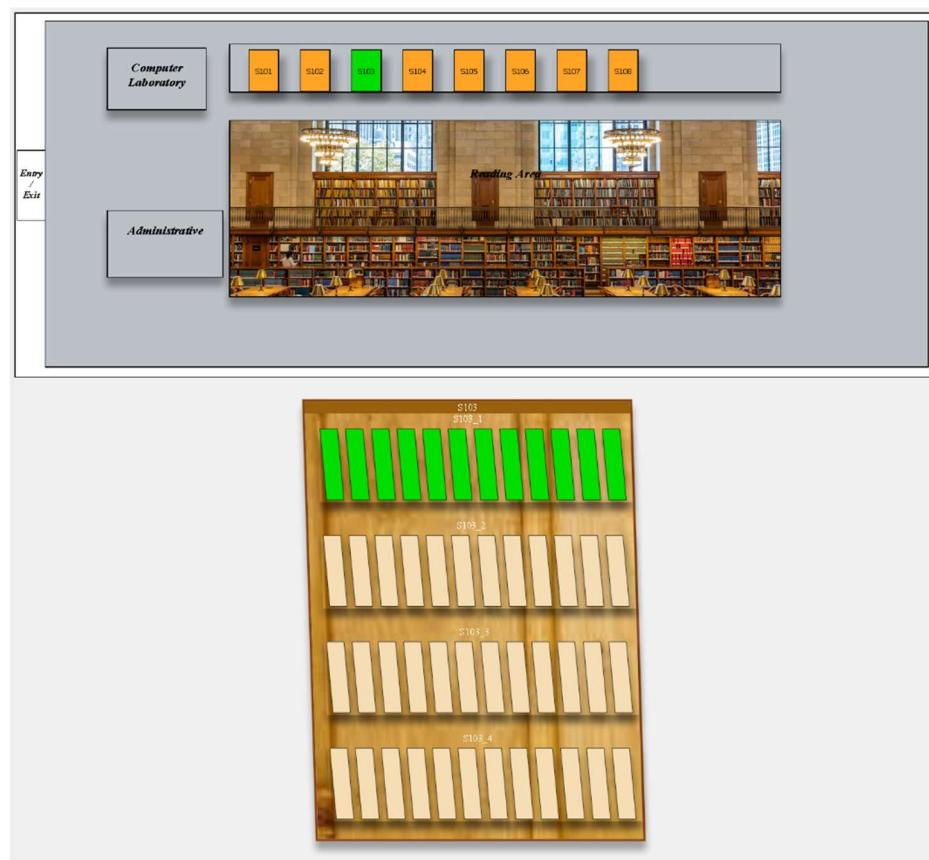


Figure 4.14 Book Location

#### Description

Description	Filtered Report.
Input Fields	Enter a Book name
Name of User interface	Graphical view Book Location
Used Relations	tbl_shelftierconfiguration_slsms
Output Fields	-
Usage	It shows the adject location of the searched book.
User	Members (Student & faculty)

Table 4.8 Book Location Report Description

### 4.3 Summary

Sr. No	User	No of Reports
1.	Administrator	7
2.	Librarian	13
3.	Member	1
	Total	21

Table 4.9 Summary of Reports

# Chapter-5 Project testing

## 5.1 Evaluation Methods

### 1) Unit Testing: -

This testing is performed at the end of each module to check the individual functionality.

Unit Testing will be carried out manually by different combinations of input data.

Example: -

Page Name	Module / Functions
Search Book	Member Module
View Reports	Librarian
View Misplace Books	Librarian
Graphical representation	Member Module

### 2) Database Testing: -

Database testing is performed at each level as well as for each module of the system. As to perform CRUD operation this testing will be helpful to check the accuracy of the data.

Example: -

Page Name	Table Names
Manage Floor (Insert/Update/Delete)	tbl_floorinfo_master_slsms, tbl_categorywise_arrangement_configuration_onfloor_slsms
Manage Shelf (Insert/Update/Delete)	tbl_shelfinfo_slsms,      tbl_shelfmainsection_master_slsms, tbl_shelfsubsection_slsms, tbl_shelftierconfiguration_slsms
Manage Reader (Insert/Update/Delete)	tbl_rfid_reader_configuration_shelf_slsms, tbl_bookrfidconfiguration_slsms
Manage Book (Insert/Update/Delete)	tbl_bookinfo_master_slsms,      tbl_bookconfiguration_slsms, tbl_bookrfidconfiguration_slsms
View Misplace Books	tbl_shelfinfo_slsms,      tbl_shelfmainsection_master_slsms, tbl_shelfsubsection_slsms,   tbl_shelftierconfiguration_slsms, tbl_rfid_reader_configuration_shelf_slsms, tbl_bookrfidconfiguration_slsms,

## Smart Library Shelf Management System

	tbl_bookinfo_master_slsms,   tbl_bookconfiguration_slsms, tbl_bookrfidconfiguration_slsms
--	--

### 3) User Interface Testing: -

This testing is mainly performed to check the valid data inputted by the different user of the system with the use of sample data and expected output.

Example

Page Name	Form Input Fields
Manage Book (Add Book)	Book library ID, Book title, Book section, Book Author, Book Publication, Book ISBN13, Book Language, Book Paperback
Manage Book (Update Book)	Book title, Book section, Book Author, Book Publication, Book ISBN13, Book Language, Book Paperback
Search Book	Book title, Book Author, Book Publication, Book ISBN13,
Institute and Course Information	Course ID, Institute ID, Course Name, Institute Name

### 4) Integration Testing: -

Integration testing will be performed once the unit testing of each and every individual module is done. All the modules will be integrated and data flow will be tested.

Module Name
Configuration of books on shelves
View Misplace Book Information
Graphical Representation of shelf
Correct information of the misplaced book

### 5) Validation Testing: -

Validation Testing is performed on the data inputted ensuring the form and correctness of the data with defined format of data-type.

Page Name	Form	Field-Data-Type/length
-----------	------	------------------------

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Manage Book Information	(Insert/Update) Book	Book Title-Alphanumeric Description-Alphanumeric Author-Characters Publisher-Characters Quantity-Integer Price-Float ISBN-Numeric Category-Characters
-------------------------	----------------------	--

## 5.2 Testing Tool specification

- Selenium is an umbrella project for a range of tools and libraries that enable and support the automation of web browsers.
- It provides extensions to emulate user interaction with browsers, a distribution server for scaling browser allocation, and the infrastructure for implementations of the W3C WebDriver specification that lets you write interchangeable code for all major web browsers.
- Selenium brings together browser vendors, engineers, and enthusiasts to further an open discussion around automation of the web platform. The project organizes an annual conference to teach and nurture the community.
- Selenium is many things but at its core, it is a toolset for web browser automation that uses the best techniques available to remotely control browser instances and emulate a user's interaction with the browser.
- It allows users to simulate common activities performed by end-users; entering text into fields, selecting drop-down values and checking boxes, and clicking links in documents. It also provides many other controls such as mouse movement, arbitrary JavaScript execution, and much more.

## Smart Library Shelf Management System

- Although used primarily for front-end testing of websites, Selenium is at its core a browser user agent library. The interfaces are ubiquitous to their application, which encourages composition with other libraries to suit your purpose.
  
- Selenium's minimalist design approach gives it the versatility to be included as a component in bigger applications. The surrounding infrastructure provided under the Selenium umbrella gives you the tools to put together your grid of browsers so tests can be run on different browsers and multiple operating systems across a range of machines.
  
- Imagine a bank of computers in your server room or data center all firing up browsers at the same time hitting your site's links, forms, and tables—testing your application 24 hours a day. Through the simple programming interface provided for the most common languages, these tests will run tirelessly in parallel, reporting back to you when errors occur.
  
- It is an aim to help make this a reality for you, by providing users with tools and documentation to not only control browsers but to make it easy to scale and deploy such grids.

## 5.3 Testing functionalities

### 5.3.1 Name of Functionality-Manage Floor Information (Add Floor)

#### Screenshot

The screenshot shows the Selenium IDE interface with the following details:

- Project:** slsms\*
- Untitled\*** is the current test case.
- URL:** http://localhost:8080/SmartLibraryShelfManagement/Administrator/floor-add.html
- Test Script (Table):**

	Command	Target	Value
1	open	http://localhost:8080/SmartLibraryShelfManagement/Administrator/floor-add.html	
2	verify text	name=txt_floorNumber	
3	submit	id=btn_submit	
4	verify selected value	name=maxallowedshelf	8
5	click	name=add	
6	click	name=remove	
- Run Status:** Runs: 1 Failures: 0
- Log (List):**
  - 2. verifyText on name=txt\_floorNumber OK 09:23:44
  - 3. submit on id=btn\_submit OK 09:23:46
  - Warning submit is deprecated and will be removed from later versions of Selenium IDE, please re-record the step. 09:23:48
  - 4. verifySelectedValue on name=maxallowedshelf with value 8 OK 09:23:46
  - 5. click on name=add OK 09:23:48
  - 6. click on name=remove OK 09:23:50
  - 'Untitled' completed successfully 09:23:51

Figure 5.1 Add Floor Selenium Testing page

## Smart Library Shelf Management System

### *Testcase Description*

Test Scenario ID	Test Scenario	Test Case Name	Test Steps	Test Data	Expected Outcome	Actual Outcome	Result
1	Select maximum number of allowed shelves	Check max no of shelves selected properly	Whether the allowed shelves are selected or not	(Select any number from Drop-Down)	Allow to proceed further	Can select the main section of the floor	Pass
2	Select maximum number of allowed shelves	Check max no of shelves not selected properly	Whether the allowed shelves are selected or not	(Select any number from Drop-Down)	Not allow to proceed further	Cannot select the main section of the floor	Fail

Table 5.1 Add Floor Test Case Report

## Smart Library Shelf Management System

### 5.3.2 Name of Functionality: -Manage Shelf Information (Add Shelf Information)

#### Screenshot

Extension: (Selenium IDE) - Selenium IDE - slsms\* - Mozilla Firefox

Project: slsms\*

Executing Untitled\*

http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageShelfInformation/Shelf-Add

Command	Target	Value
1 open	http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageShelfInformation/Shelf-Add	
2 verify element present	name=floornumber	
3 verify selected value	name=floornumber	0
4 submit	id=btn_submit	
5 verify editable	name=subsection	

Command Target Value

Target

Value

Description

Runs: 1 Failures: 0

Log Reference

- 1. open on http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageShelfInformation/Shelf-Add OK 09:32:26
- 2. verifyElementPresent on name=floornumber OK 09:32:26
- 3. verifySelectedValue on name=floornumber with value 0 OK 09:32:27
- 4. submit on id=btn\_submit OK 09:32:27
- Warning submit is deprecated and will be removed from later versions of Selenium IDE, please re-record the step. 09:32:28
- 5. verifyEditable on name=subsection OK 09:32:28
- 'Untitled' completed successfully 09:32:29

Figure 5.2 Add Shelf Information Selenium Testing

## Smart Library Shelf Management System

### ***Testcase Description***

<b>Test Scenario ID</b>	<b>Test Scenario</b>	<b>Test Case Name</b>	<b>Test Steps</b>	<b>Test Data</b>	<b>Expected Outcome</b>	<b>Actual Outcome</b>	<b>Result</b>
1	Select the floor number	Check proper subsection appears for the shelves.	Whether all the subsection have been appeared	(Select any floor number from Drop-Down)	Allow to proceed further.	Can select the number of tiers for shelves.	Pass
2	Select the sub-section.	Check total number of shelves selected previously appears or not.	Whether the no of shelves appear	(Select any sub-section from Drop-Down)	Not allow to proceed further	Cannot select the number of tiers for shelf.	Pass

Table 5.2 Add Shelf Information Test Case Reports.

## Smart Library Shelf Management System

### 5.3.3 Name of Functionality: - Manage Book information (Add Book Information)

#### Screenshot

Extension: (Selenium IDE) - Selenium IDE - sdesf\* - Mozilla Firefox

Project: sdesf\*

Executing Untitled\*

http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/BookConfiguration.jsp

	Command	Target	Value
1	open	http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/BookConfiguration.jsp	
2	verify editable	id=title	
3	type	id=txt_bookheight	
4	submit	name=btn_submit	
5	verify selected value	name=txt_subsectionid	0

Command Target Value

Target

Description

Runs: 1 Failures: 0

Log Reference

- 1. open on http://localhost:8080/SmartLibraryShelfManagement/Librarian/ManageBookInformation/BookConfiguration.jsp OK 09:57:53
- 2. verifyEditable on id=title OK 09:57:53
- 3. type on id=txt\_bookheight OK 09:57:55
- 4. submit on name=btn\_submit OK 09:57:55
- Warning submit is deprecated and will be removed from later versions of Selenium IDE, please re-record the step. 09:57:55
- 5. verifySelectedValue on name=txt\_subsectionid with value 0 OK 09:57:55
- 'Untitled' completed successfully 09:57:55

Figure 5.3 Add Book Details Selenium Testing

## Smart Library Shelf Management System

### *Testcase Description*

Test Scenario ID	Test Scenario	Test Case Name	Test Steps	Test Data	Expected Outcome	Actual Outcome	Result
1	Check the validity of BookTitle.	Book Title	Whether the field is fill properly.	Book Title: -Java: The complete reference	Allow to Fill another information.	Can fill another information.	Pass
2	Check the validity of Book Author.	Book Author	Whether the field follows proper regular expression.	Book Author: Roger 123Pressman	Show invalid author name message.	Shows invalid message.	Pass
3	Check the paperback information of book	Book Paper back	Whether the paperback is written properly or not	Book PaperBack: 856	Allow to fill another information.	Can fill another information.	Pass
4	Check the dimension of the book	Book's length, breadth and height	Whether the length, breadth and	Book dimensions : Height 17cm,	Allow to fill another information.	Can fill another information.	Pass

## Smart Library Shelf Management System

		are filled properly or not	height are in cm	Breadth 4cm, Length:12			
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Table 5.3 Add Book Information Test Case Report

### 5.3.4 Name of Functionality: - Manage Institute & Course (Add Institute Information)

#### Screenshot

Extension: (Selenium IDE) - Selenium IDE - slsms\* - Mozilla Firefox

Project: slsms\*

Tests + ✖

Untitled\*

Search tests... ✖

Command Target Value

1	open	http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstituteandCourseDetails/AddInstitue.jsp
2	verify editable	id=bt_InstitueName
3	click	id=add
4	verify text	id=bt_courseName
5	submit	id=btn_submit

Command ✖

Target ✖

Value ✖

Description ✖

**Log** **Reference**

```

1. open on http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageInstituteandCourseDetails/AddInstitue.jsp OK      09:40:18
2. verifyEditable on id=bt_InstitueName OK      09:40:18
3. Trying to find id=add... OK      09:40:19
4. verifyText on id=bt_courseName OK      09:40:23
5. submit on id=btn_submit OK      09:40:23
Warning submit is deprecated and will be removed from later versions of Selenium IDE, please re-record the step.      09:40:24
'Untitled' completed successfully      09:40:24

```

Figure 5.4 Add Institute Selenium Testing

## Smart Library Shelf Management System

### *Testcase Description*

<b>Test Scenario ID</b>	<b>Test Scenario</b>	<b>Test Case Name</b>	<b>Test Steps</b>	<b>Test Data</b>	<b>Expected Outcome</b>	<b>Actual Outcome</b>	<b>Result</b>
1	Enter the name of institute.	Entered name of institute is proper or not.	Whether the institute have only alphabet s and length more than six characters.	Institute Name: Shrimad Raj Chandra Institute of Management and Computer Application	Allow to submit institute information	Can submit the institute information.	Pass
2	Enter the name of institute	Entered name of institute is proper or not	Check whether the institute name have only alphabet s and length more than six character as well as it	Institute Name: Shrimad Raj Chandra Institute of Management and Computer Application	Show institute information already exists	Displayed institute information already exists.	Pass

## Smart Library Shelf Management System

			previous y exists or not.				
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Table 5.4 Add Institute Test Case Report

### 5.3.5 Name of Functionality: - Manage Reader Information (Add Reader Information)

#### Screenshot

Extension: (Selenium IDE) - Selenium IDE - slsms\* - Mozilla Firefox

Project: slsms\*

Executing Untitled\*

http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/AddRfidReaderData.jsp

Command	Target	Value
1 open	http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/AddRfidReaderData.jsp	
2 verify element present	name=txt_upc	
3 verify editable	name=txt_upc	
4 submit	id=btn_submit	

Runs: 1 Failures: 0

Log Reference

Running 'Untitled'

1. open on http://localhost:8080/SmartLibraryShelfManagement/Administrator/ManageRFIDReader/AddRfidReaderData.jsp OK 09:45:39

2. verifyElementPresent on name=txt\_upc OK 09:45:40

3. verifyEditable on name=txt\_upc OK 09:45:42

4. submit on id=btn\_submit OK 09:45:42

Warning submit is deprecated and will be removed from later versions of Selenium IDE, please re-record the step. 09:45:42

'Untitled' completed successfully 09:45:42

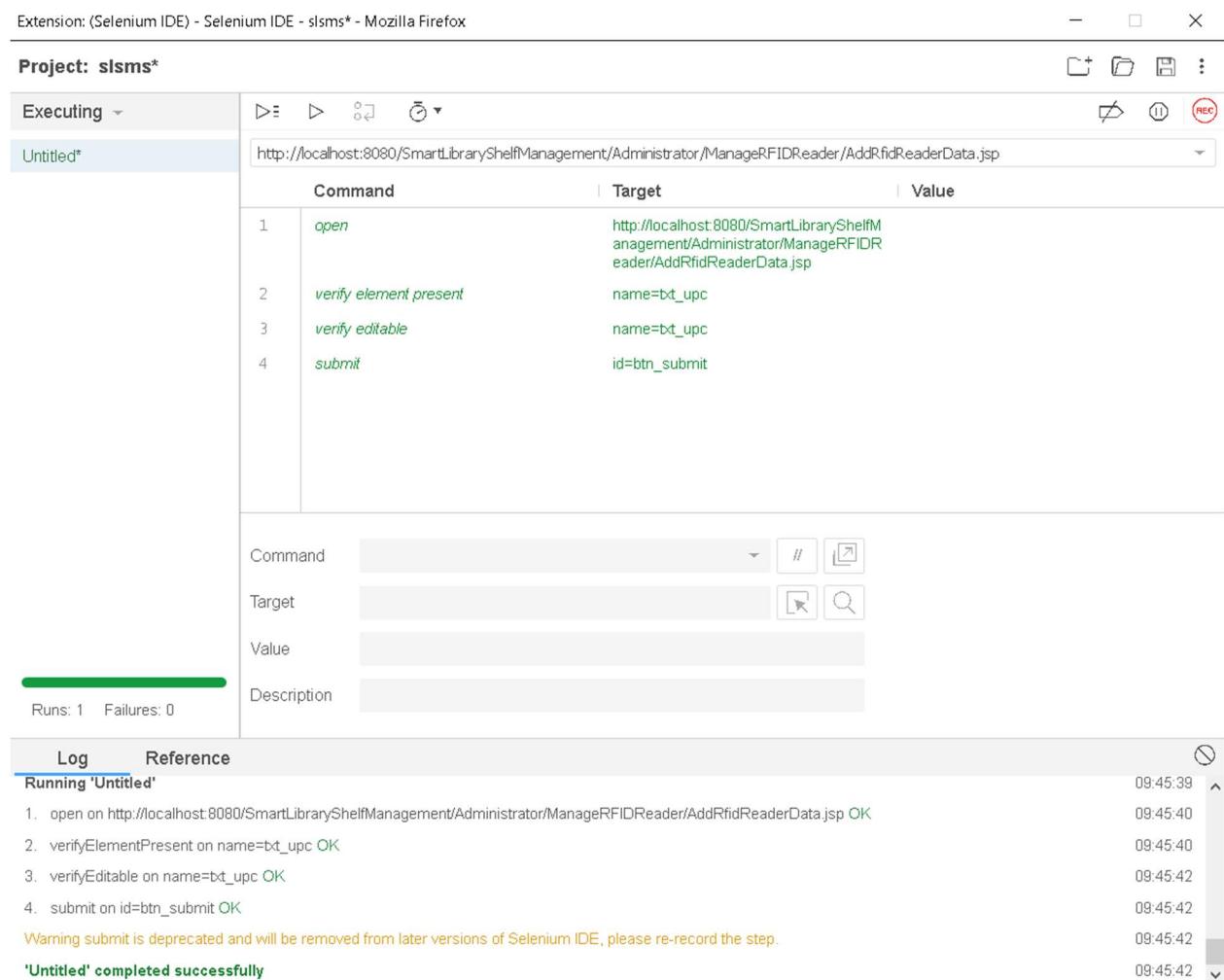
The screenshot shows the Selenium IDE interface. The top bar includes project name, tabs, and toolbar buttons. The main area has a table with four rows of test steps. Step 1: 'open' the target URL. Step 2: 'verify element present' on element 'name=txt\_upc'. Step 3: 'verify editable' on element 'name=txt\_upc'. Step 4: 'submit' on element 'id=btn\_submit'. Below the table are input fields for 'Command', 'Target', 'Value', and 'Description'. A progress bar at the bottom indicates 1 run and 0 failures. The log panel at the bottom shows the execution details with timestamps.

Figure 5.5 Add reader information Selenium Testing

## Smart Library Shelf Management System

### *Testcase Description*

Test Scenario ID	Test Scenario	Test Case Name	Test Steps	Test Data	Expected Outcome	Actual Outcome	Result
1	Enter the Universal Product of RFID reader.	Entered Universal Product of RFID reader is proper or not.	Whether the UPC of reader is of 14 digits or not.	UPC:85469712345678	Allow to submit Reader information	Can submit the Reader information.	Pass
1	Enter the Universal Product of RFID reader.	Entered Universal Product of RFID reader is proper or not.	Whether the UPC of reader is of 14 digits or not as well as it exists preciously or not.	UPC:85469712345678	Show Reader already exists message.	Displayed reader already exists message.	Pass

Table 5.5 Add Reader Information Test Case Report

## Chapter 6 Future Scope

The future scope of this system is superior because it provides various automotive functionalities that decrease the tedious and manual works of its users. The system effectiveness can be increased by using the high range and configured RFID Reader as well as the tags. The capability of the system, as well as the accuracy of the searching process, can be inflated by summatting NoSQL Database.

# Chapter 7 Learning during project work

The project is a combination of management and creation of a unique product. As there was the introduction of a new concept called IoT(Internet of Things) it was a very extremely good experience to learn such new things and there were lots of confusions and problems at the initial stage of IoT devices working but our internal guide had always help in solving the queries and introducing to some new technologies also such as Cloud Services, JMeter, etc. There were many other things that we learn which was assigned the task to the members as per their ability to understand the complexity. As we have chosen this title 'Smart Shelf Library Shelf Management' based on our own experience we understood that there are many concepts that can be learned from real life. And we also learn new technologies in a very short period such as JavaScript, AJAX. Overall, we learned the art of management.

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