Software Requirements Specification

for

Software Laboratory Management System (SLMS)

Version 1.0 approved

Prepared by Group-12

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1. Introduction

1.1 Purpose

The purpose of this document is to present a detailed description of the Software Laboratory Management System (SLMS). It will explain the purpose and features of the software, the interfaces of the software, what the software will do, and the constraints under which it must operate. This document is intended for users of the software and also potential developers.

1.2 Document Conventions

This document was created based on the IEEE template for System Requirement Specification Documents.

1.3 Intended Audience and Reading Suggestions

- Typical Users, such as students, faculty members who want to use Software Laboratory Management System (SLMS) while using laboratory resources.

- Administrators, such as labs-in-charge and lab assistants, monitor the usage of laboratory and server resources.

- Programmers who are interested in working on the project by further developing it or fixing existing bugs.

1.4 Product Scope

The Software Laboratory Management System (SLMS) is a tool that people can use to analyze and manage access to laboratory resources in Software Laboratories. Users can use it to add new users, manage and monitor access to servers and computing clusters. They can alter the layout of the laboratory server clusters or calculate metrics of it, to understand their data in a better way and discover hidden aspects about it, such as patterns or faults during data backups and resource allocation.

1.5 References

[1] IEEE Template for System Requirement Specification Documents: https://goo.gl/nsUFwy

[2] GNU General Public License version 3: http://www.gnu.org/licenses/gpl.html

[3] CDDL Common Development and Distribution License:
https://opensource.org/licenses/CDDL-1.0

2. Overall Description

2.1 Product Perspective

Software Laboratory Management System (SLMS) was developed for everyone who uses or manages laboratory resources or someone who seeks to understand and analyze usage data. It can handle between 2000-2200 users. It can print analytics information in various formats (SQL, SQLX, CSV...) regarding the usage of the resources and is capable of detecting inconsistencies in the system. It is a commercial project and it has a very active developer team to support it and provide feedback to users. It was developed to run on Windows and Linux.

2.2 User Roles

Roles	Description
Superuser	superuser is a special user account used for system administration.
Faculty	Professors who set the assignments, guide the students, and conduct viva-voce and practical examinations. They can also use the lab facilities for their own research
Student	Users who use the laboratory resources as students to submit assignments, etc.
Technician	Technicians are the ones who maintain the system. They look after the technical challenges.
Scholar	Scholars are researchers who assist Faculty members and can access resources for their research purpose.

2.3 Functional Requirement

User Role	User Story	Input	Output	Acceptance Criteria
Student	Students should be able to log in to the portal using a username and a password.	Login screen where the user enters his/her username and password.	A dashboard showing all the necessary details.	● Username and password should match

Student	Students should be able to reset their password in case they forget it.	A forgotten password section takes the username of the user as input.	A password reset link is sent to the registered email of the user, along with an OTP to the registered mobile number of the user to ensure that the password reset process was triggered by the user themselves.	● The username and registered mobile number entered by the user should be present in the database ● OTP entered by the user should match. ● New and old passwords should be different. ● The new password should be a mix of alphanumeric characters and must contain at least 1 digit, 1 capital letter and 1 special symbol.
Student	Students can submit feedback every 2 weeks regarding the lab experience and how it can be improved.	Feedback form.	Feedback submitted.	● All necessary fields in the form must be completed. ● The user should be logged in.
Student	Students should be able to upload their assignments after completion.	Completed assignment.	Confirmation message.	● The assignment should be uploaded in the appropriate format. ● The user should be logged in.
Student	Students should be able to clock in their attendance.	Mark attendance after entering the lab class.	Confirmation message.	● The student should be present in the lab throughout the lab hours. ● The user should be logged in.
Student	Students should have access to the	Login screen for cloud storage	A dashboard for the student's	● The user should be

	cloud storage to access their submitted assignments and use it for other academic purposes as and when required.	where the user enters his/her username and password.	profile will be displayed. Here the student should be able to see the current content of the cloud storage and modify it.	logged in.
Faculty	Faculty should be able to log in to the portal using a username and password.	Login screen where the user will write username and password.	Dashboard with all the necessary details.	● The username & Password should match.
Faculty	Faculty should be able to view and manage which classrooms they are assigned to and set up new classrooms and admit new students.	Classroom details.	Dashboard with all classrooms.	● The user should be logged in.
Faculty	Faculty should be able to view the performance of students in their class.	Classroom ID.	Performance report.	● The user should be logged in.
Faculty	Faculty should be able to schedule and conduct examinations.	Date, duration, and question paper.	Scheduled examination in the calendar and automatic mail to each student.	● The user should be logged in.
Faculty	Faculty should be able to post, view, check and grade assignments.	Deadline, and Assignment. Classroom to post the assignment to.	● Scheduled assignment submission date in the calendar and automatic mail to each student.	● The user should be logged in.

			● Upload the assignment statement to cloud. ● Student statistics	
Faculty	Faculty should be able to apply for server time and supercomputing resources from the dashboard.	Server time in hours and resources in GB.	Server authentication token.	● The user should be logged in.
Faculty	Faculty should have access to the cloud storage to access submitted assignments and use it for other academic purposes as and when required.	Login screen for cloud storage where the user enters his/her username and password.	A dashboard for the Faculty profile will be displayed. Here the faculty should be able to see the current content of the cloud storage and modify it.	● Username and password should match
Faculty	Faculty should be able to view student feedback statistics.	Classroom ID.	Feedback report.	● The user should be logged in.
Technician	Technicians will be able to log in to the portal.	Login screen where the user enters his/her username and password.	A dashboard with all the required details.	● Username and password should be the same.
Technicians	They can view and manage all the technical issues raised by the other users.	Complaint received.	Authority to respond and resolve the issue.	● The user must be logged in.
Technicians	Can maintain the software operations and	Receives the software and security records at regular intervals of	Error Log generation	● The user must be logged in.

	security.	time. Alert is issued in case of any breach in security.		
Technicians	Can assist students with troubleshooting to get the expected results.	Complaint received.	Resolve the error.	● The user should be logged in. ● An issue must be present.
Technicians	Can view the software update messages, and install them.	Updates pop up.	Updates installed.	● The user should be logged in.
Scholar	Scholars should be able to log in to the portal using a username and password.	Login screen where the user will write username and password.	Dashboard with all the necessary details.	● The username & Password should match.
Scholar	Scholars should be able to view, check and grade assignments submitted by students.	Grade Assignment.	Awarded grades will be shown.	● The user should be logged in.
Scholar	Scholars should be able to apply for server time and supercomputing resources from the dashboard.	Server time in hours and resources in GB.	Server authentication token.	● The user should be logged in.
Scholar	The scholar should have access to the cloud storage to access submitted assignments and use it for other	Login screen for cloud storage where the user enters his/her username and password.	A dashboard for the scholar profile will be displayed. Here the scholar should be able to see the current content of the	● Username and password should match

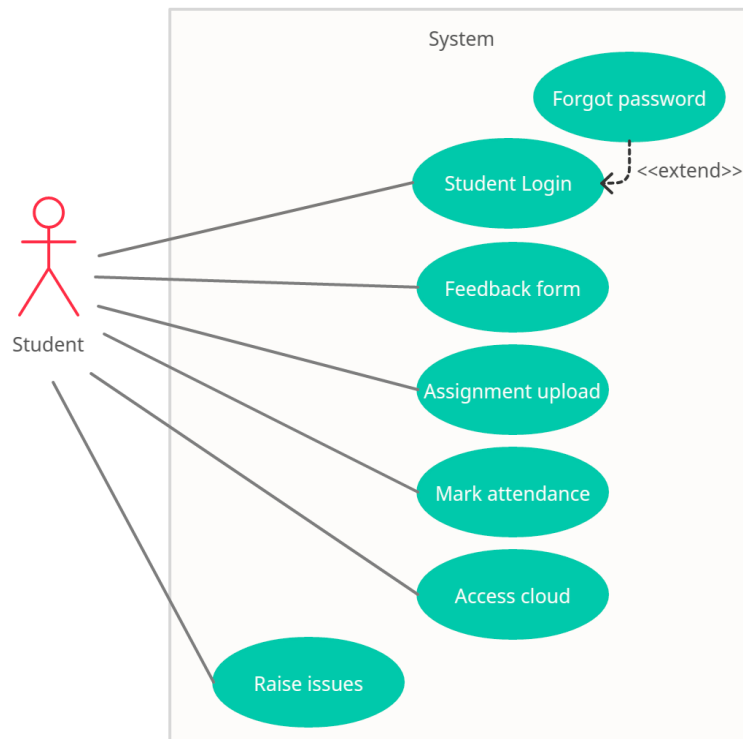|			
	academic purposes as and when required.		cloud storage and modify it.	
Scholar	Scholars should be able to view student feedback statistics.	Classroom ID.	Feedback report.	● The user should be logged in.
Superuser	Superuse should be able to log in to the portal using a username and a password.	Login screen where the user enters his/her username and password.	A dashboard showing all the necessary details.	● Username and password should match
Superuser	Superuser should be able to reset their password in case they forget it.	A forgotten password section takes the username of the user as input.	A password reset link is sent to the registered email of the user, along with an OTP to the registered mobile number of the user to ensure that the password reset process was triggered by the user themselves.	● The username and registered mobile number entered by the user should be present in the database ● OTP entered by the user should match. ● New and old passwords should be different. ● The new password should be a mix of alphanumeric characters and must contain at least 1 digit, 1 capital letter and 1 special symbol.
Superuser	Should be able to perform all administrative work.	Click on the appropriate button on Dashboard	Various options must be shown	Superuser should be logged in.

2.3.1 Use Case Diagrams

Figure1: Use Case Diagram of Student

Figure 2: Use Case Diagram of Faculty

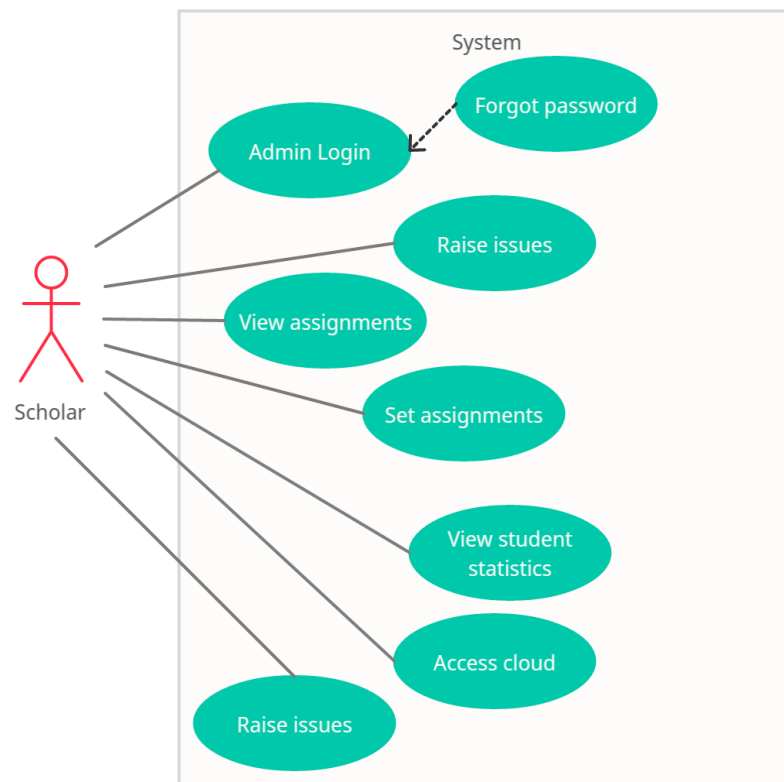*Figure 3: Use Case Diagram of Technician*
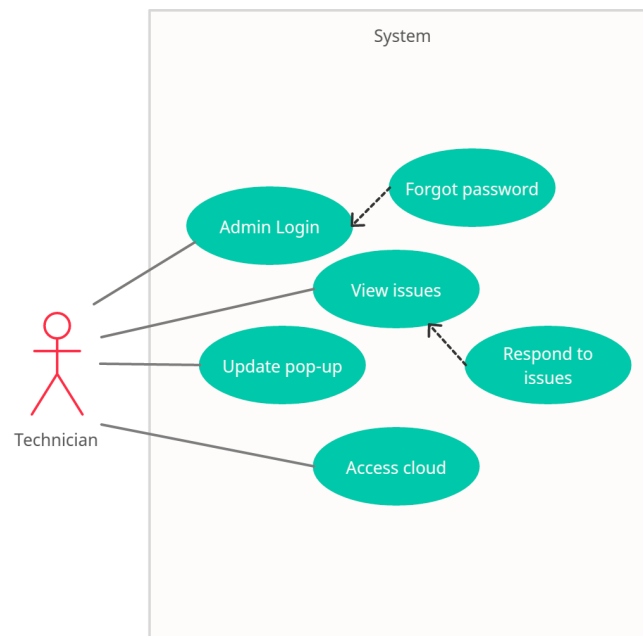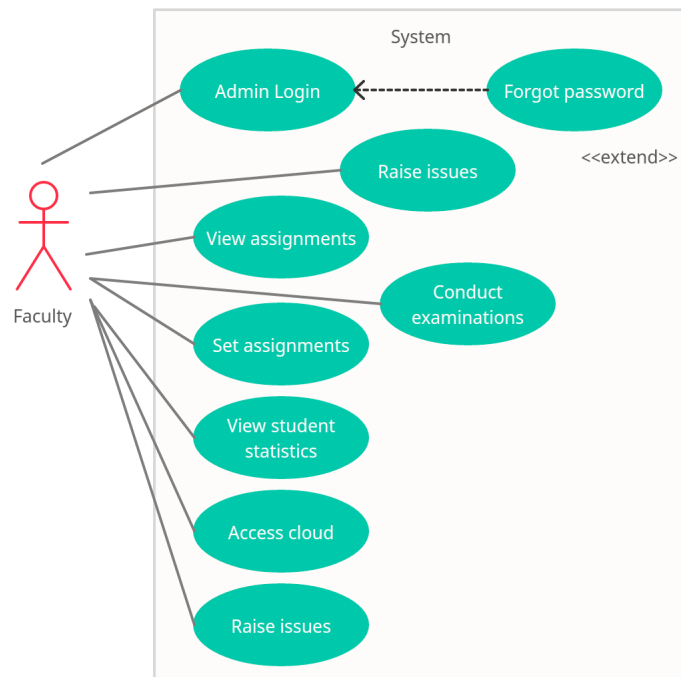
Figure 4: Use Case Diagram of Scholar

2.4 Typical Users and Class Diagram

- Typical users, such as students, faculty members who want to use Software Laboratory Management System (SLMS) while using laboratory resources.
- Administrators, such as labs-in-charge and lab assistants who monitor the usage of laboratory and server resources.
- Programmers who are interested in working on the project by further developing it or fixing existing bugs.
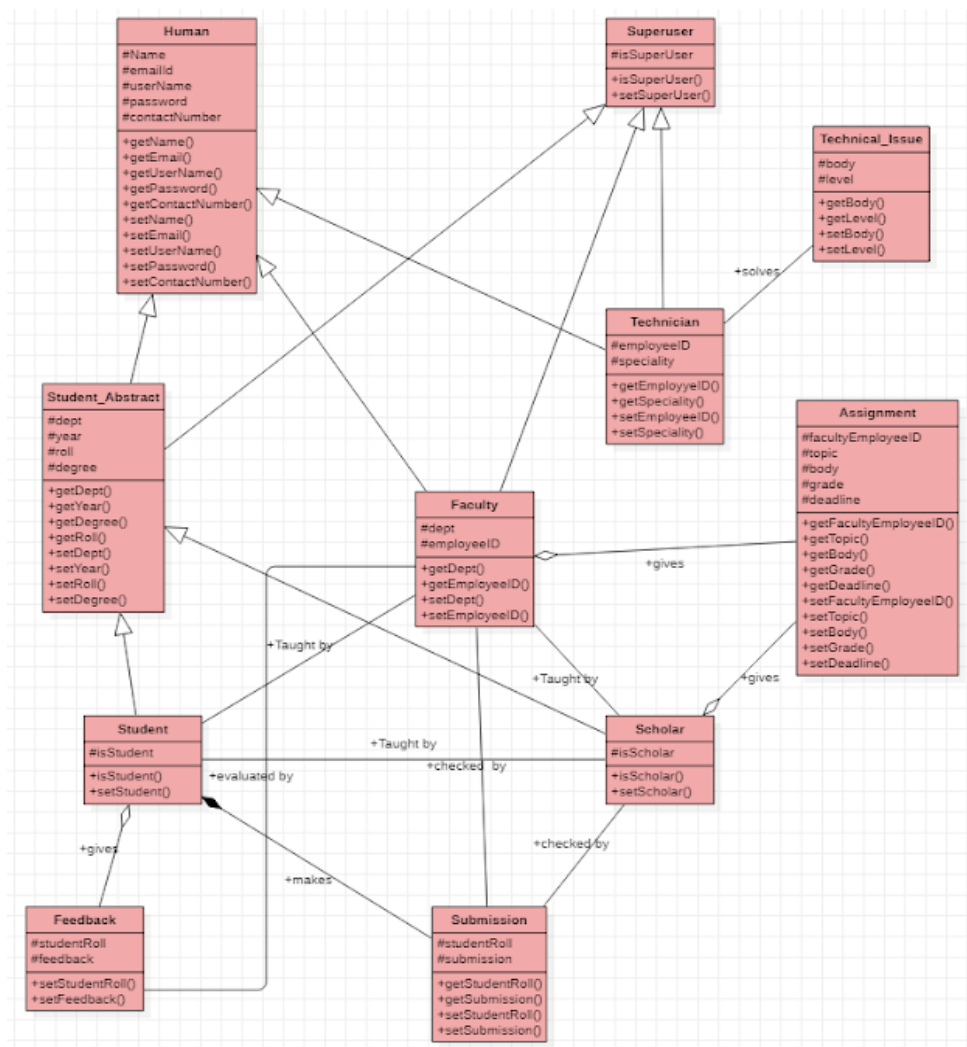

Figure 5: Class Diagram of SLMS
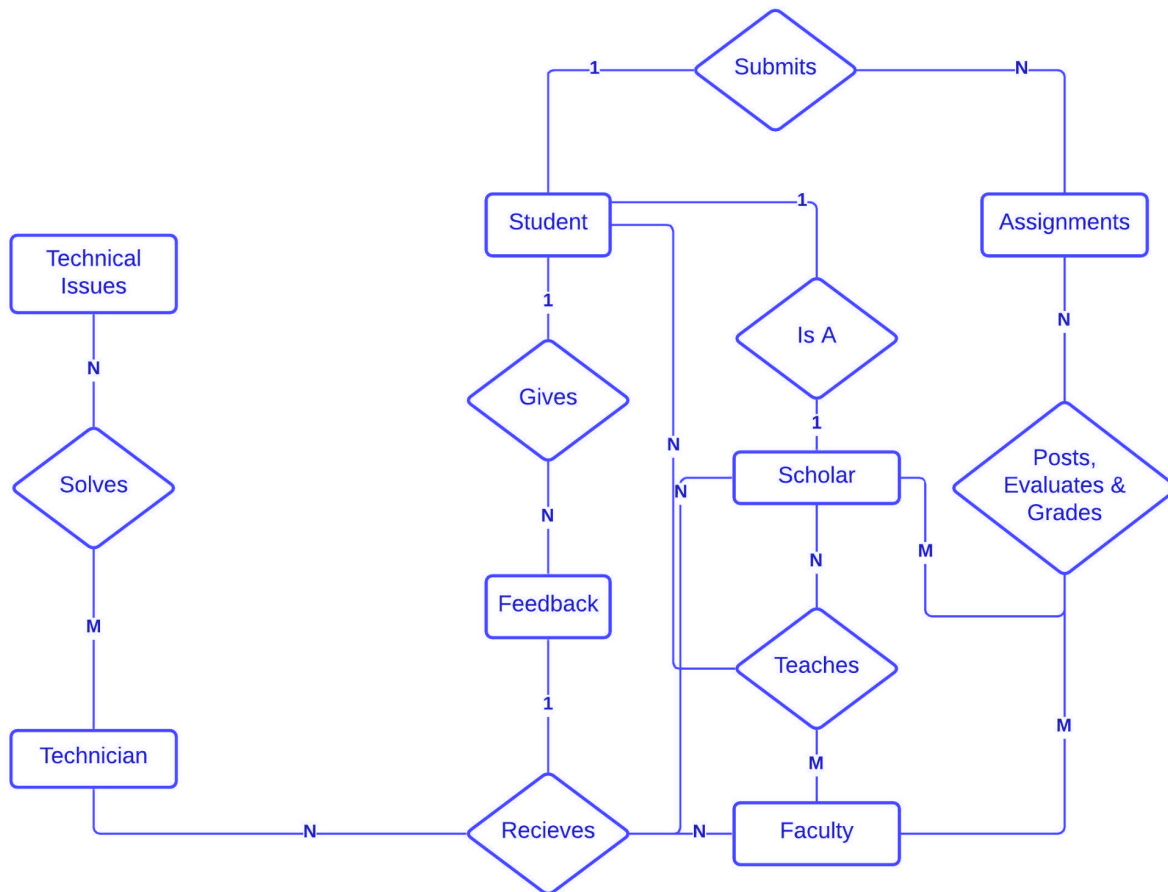
2.5   Data Modeling

Figure 6: Entity Relationship Diagram

2.6   Operating Environment

Operating Systems:

- Windows 2000
- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 10
- Ubuntu
- Raspbian

Browsers:

- Chrome
- Firefox
- Chromium

2.7   Dependencies and Constraints

- Software Laboratory Management System (SLMS) is developed in Python and uses LAMP stack with MySQL and therefore requires Python, LAMP, and MySQL to be installed on the user's server system.
- The minimum hardware requirements of Software Laboratory Management System (SLMS) are a 3.5 Gigahertz CPU and 1024 megabytes of RAM.
- It can only support 2000-2200 users at a time.

3.   External Interface Requirements

3.1   Hardware Interfaces

The minimum hardware requirements of Software Laboratory Management System (SLMS) are a 3.5 Gigahertz CPU and 1024 megabytes of RAM.

3.2   Software Interfaces

Software Laboratory Management System (SLMS) is developed in Python and uses LAMP stack with MySQL and therefore requires Python, LAMP, and MySQL to be installed on the user's server system.

Operating Systems:

- Windows 2000
- Windows XP
- Windows Vista
- Windows 7
- Windows 8
- Windows 10

- Ubuntu
- Raspbian

Browsers:

- Chrome
- Firefox
- Chromium

3.3   Communications Interfaces

Software Laboratory Management System (SLMS) requires other machines and devices to be connected to a star or mesh topology network and a central system to host it from, which must also be connected to the network. The network can be connected to the internet or be air-gapped.

4.   System Features

This section demonstrates Software Laboratory Management System (SLMS)'s most prominent features and explains how they can be used and the results they will give back to the user.

4.1   User Logging System

The user will be able to use the software only if he/she has properly filled the login credentials that are namely username and password. On successful login, the user will be directed to a dashboard showing all the necessary details.

4.2   Attendance Registering System

It is a system feature that will record the regularity of the users (students, faculty, technicians, scholars) on a day-to-day basis. It will maintain an accurate record and will also be able to generate a summarized report for the same. After the user login, a dashboard enabling and asking the users to mark their attendance will appear. The users may then mark and lock their attendance. A leave application facility for the users will also be available that will allow them to apply for leaves. However, it is not necessary that they will be granted leaves for sure. The leave application may be both accepted as well as rejected.

4.3   Resource Access Management Log

Resource access management is crucial from the perspective of an organization. It helps to monitor user access permission and access rights to help protect the organization from data loss and security breaches. The resource access management maintains a log consisting of users with their respective access permissions, the authorization of which, may be changed as and when needed. It limits the users from exploiting all the unnecessary facilities, services, etc., and will only be given access to certain facilities and services as per their requirements.

4.4   Brute Force Protection System

Brute Force Protection has been enabled to protect the system or software against any brute force attack that involves multiple attempts to guess trial and error to guess login information and other vital keys. The

system will strictly allow only strong passwords which are unique, long, and are hard enough to guess. There will be limited login attempts per user. Disregarding it may lead to a temporary ban and hence blocking the subsequent attempts. Captcha is incorporated to prevent the bots and other automated tools from using the software.

4.5   Server Backup Software

It will ensure that the information stored or processed through the server will remain safe, secure, and intact even in the case of failure or user error. It will keep all the processed data in a remote location in order to prevent data loss during any unfortunate circumstances.

4.6   User and Resource Management Portal

It is the process of allocating resources to the users to achieve the greatest optimization value. It helps when there is an availability of resources at the time of need. It will assess the skills of the users and will help in prioritizing initiatives that require maximum attention and skills.

5.   Other Nonfunctional Requirements

5.1   Performance Requirements

Software Laboratory Management System (SLMS) is developed in Python and uses LAMP (Linux, Apache, MySQL, PHP/Python/Perl) stack with MySQL and therefore requires Python, LAMP, and MySQL to be installed on the user's server system. It also needs the system to be connected to a Local Area Network (LAN) and must have at least 500 Megahertz CPUs and 128 megabytes of RAM.

5.2   Safety Requirements

To ensure that no one of the Software Laboratory Management System (SLMS)'s users loses any data while using Software Laboratory Management System (SLMS) (due to a crash or a bug of some kind) the developer team updates the Software Laboratory Management System (SLMS) regularly. There is a bug tracker available where users can report any bugs they have encountered so that the developers can fix them in the next release.

5.3   Security Requirements

- The password should have more than 8 characters and should also contain 1 number, 1 capital letter and 1 special character.
- The default password set by the Superuser must be reset by the user up on first login.
- Any change in information by the users will be notified to the Superuser
- Privacy of information, the export of restricted technologies, intellectual property rights, etc. should be audited.

5.4   Software Quality Attributes

Software Laboratory Management System (SLMS) provides the users with both simple and advanced features. Due to its well-designed and easy-to-use interface, it can be used by both experts and typical users.

Some of the Software Quality Attributes are:

- Reliability and Availability
- Maintainability
- Portability
- Flexibility
- Reusability
- Efficiency