**Course and Lab Allocation System**

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**Abstract :**

The project's major goal is to create a mechanism for allocating courses and labs that makes it easier for lecturers to register for classes. The project intends to address the issues with the manual allocation approach, including the difficulty for academics to obtain courses in their areas of competence, the allocation of more courses to lecturers with better positions, and the compromise of research time. To do this, we studied earlier, comparable systems to draw analogies. The system is safer and more effective since it includes several access levels and privileges based on the user's position. Its usability has been assessed using perceived utility and ease of use. It was constructed using Python and SQL for the database.The project is a prototype and serves as a model for other universities looking to develop and enhance their own course registration systems.

1. **Introduction and Background:**

The allocation of courses and labs to instructors has always been a hectic procedure for the management of FAST. The project will address all the major allocation issues and make it efficient and easier to assign clash free venues and time slots. The system will deal with the course registration and venue and timetable issues that involve clashes. For instance, booking the room for a purpose by one department and meanwhile the room was allocated for a specific subject by the other department as university has different departments and for many courses the rooms are being shared among different department classes.So due to the manual nature of this allocation process, numerous problems have arisen.The institutions' manual allocation procedures are straightforward, but they do not give students and lecturers much freedom in terms of their selection.Thus, there is a need to examine and overhaul the current course and lab allocation method to ensure fair and equal distribution of resources and greater alignment with the requirements and preferences of both professors and students.We have studied and analyzed already existing systems for better understanding and development that are mentioned in literature review section. Also, the method is simple enough for administrators to log in and make any necessary modifications to the course/lab allotment.

1. **Problem Statement:**

A certain educational institution's existing system for allocating courses and labs has several problems that are affecting how well professors and students are performing. Teachers are dissatisfied as a result of the system's failure to give them their preferred courses even if feasible. Moreover, there is an uneven distribution of students around lab sessions, with some laboratories having more students than computers, which causes congestion and inefficient resource utilization. Additionally, venue allocation and problems are brought on by hazy and occasionally out-of-date data regarding available and occupied venues. Other than that, timetable and scheduling conflicts make the allocation of courses challenging to handle. These issues are adversely affecting the quality of education and learning outcomes for students and teachers.

1. **Objective(s)/Target(s):**

The main objectives of a course and lab allocation system project in software engineering can include:

* To reduce schedule conflicts and maximize resource usage, the system should be created to distribute resources, such as courses, classrooms, and lab equipment, most effectively feasible.
* Classes, course requirements, instructor availability, and lab equipment requirements should all be taken into account while designing the system to distribute courses and lab resources fairly and impartially.
* Students, teachers, and administrators should be able to observe the allocation results and comprehend how resources were assigned due to the system's transparency in the process of resource allocation.
* In order to accommodate changes in course offerings, class sizes, and lab equipment accessibility, the system should be made adaptable and expandable. Additionally, the system must be able to meet the demands of several departments operating within an institution.
* The system ought to have an intuitive user interface that is simple to use and browse, enabling users to monitor course and lab availability and submit allocation requests right away. Users should be given constructive criticism and pointers as they proceed through the allocation process by the system.

The fundamental goal of our system is to offer an effective, equitable, transparent, adaptable, and user-friendly method of allocating courses and lab resources within an institute.

1. **List of Features:**

**Course registration:**

Both instructors and students should be able to register for courses using the system, along with their preferences from the possible available options .

**Lab allocation:**

The system should allocate labs for different courses based on the resources of that lab and ensure that they are available at the appropriate time slot.

**Timetable management:**

A timetable for each course should be created and managed by the system, who should also make sure there are no clashes.

**Venue/Room allocation:**

Based on the enrollment and other criteria, the system should distribute classrooms and labrooms among the courses of different departments.

**User information management:**

For diverse users, including students, lecturers, and administrators, the system should manage user accounts, including login credentials, rights, and access levels.

**Reporting:**

The system should generate reports related to course and lab allocation, timetables, room assignments, and other data.

**Notifications and Pop Ups:**

Users should receive error pop ups on the system interface where necessary and notifications if someone wants to change their section so that there will be an available seat in their desired section.

**Integration with other systems:**

The system should integrate with other systems and databases and other tools for better performance.

**Security and privacy:**

Users' data, including login passwords, private information, and other sensitive data, should be secure and private on the system.

**Scalability:**

The system ought to be expandable and capable of supporting an increasing number of users and courses as required.

Overall, a system for allocating courses and labs should be simple to use, effective, and dependable in order to facilitate the management of courses, laboratories, and other associated responsibilities.

1. **Completeness Criteria:**

The following should be included in the completeness requirements for the project:

**Assembling Requirements:**

To gain a clear grasp of the needs and demands of the stakeholders engaged in the course and lab allocation process, the project should perform extensive research. This covers any policy requirements, as well as the demands of students, faculty, and administrators.

**System Design:**

The project must create a concise, in-depth system design that fully takes into account all of the requirements discovered during the research process. This entails creating the database, user interface, and software architecture.

**Implementation:**

Using proper software engineering techniques and tools, such as coding, testing, and debugging, the project should carry out the development phase by implementing the system in accordance with the design.

**User Acceptance Testing:**

To make sure the system satisfies the requirements and is user-friendly for all stakeholders, the project should carry out user acceptability testing.

**Deployment:**

To ensure the system's stability and dependability, the project should deploy the system to the production environment. Users should also receive any necessary training to ensure they can utilize the system effectively.

**Maintenance and Support:**

The project should offer continuous maintenance and support for the system, including resolving any user complaints and repairing issues.

**Performance and security:**

Performance and security needs should be met through the system's design and implementation, which should also include suitable data access controls, encryption, and performance enhancement.

**Documentation:**

To assist in the continuous maintenance and support of the system, the project should provide thorough documentation, including user manuals, technical specifications, and code documentation.

**Project management:**

To make sure the project stays on track and is finished within the anticipated timeline, it should be managed using the proper project management practices, such as frequent progress reporting, issue tracking, and risk management.

**Stakeholder communication:**

Throughout the course of the project, stakeholders should be kept in the loop in order to manage expectations and make sure that their demands are being addressed.

**Assessment and feedback:**

After the system has been deployed, the project should gather stakeholder input and assess the system's effectiveness, using the right metrics to gauge how well it met the requirements and helped the process for allocating courses and labs.

1. **Challenges:**

Developing a course and lab allocation project in software engineering can be a challenging task, with several complex components that can be considered barriers to timely completion. The following are a few probable difficulties:

**Understanding the Domain**:

Policies and standards for course and lab allocation may vary among universities. The domain-specific requirements of the associated stakeholders, including students, professors, administrators, and any pertinent regulatory agencies, must be carefully investigated.

**Designing an Effective User Interface:**

When taking into account the wide range of people that will be using the system, it can be difficult to design an intuitive and user-friendly interface. All users, including those with disabilities, must have their requirements taken into consideration while designing the interface.

**Integrating Different Technologies:**

An allocation system for courses and labs may require to integrate a number of technologies, including databases, network protocols, and security measures. It can be extremely difficult to make sure that various technologies interact with one another successfully and fluidly.

**Scaling the System:**

As institutions expand, the procedure for allocating courses and labs gets more difficult. A growing user base and more data must be supported by the system, which must be ensured.

**Ensuring Security:**

A course and lab allocation system may contain student records and other private data. Making sure the system is safe and the data is shielded from unauthorized access is essential.

**Testing and Quality Assurance:**

Extensive testing is required to make sure the system works as planned, is error-free, and satisfies the requirements of all stakeholders. To guarantee that the system is completely tested and functional, quality assurance procedures must be in place.

**Project Management:**

Effective project management is essential to completing a project of this size on schedule and within budget. A course and lab allocation project must be effectively completed with careful planning, resource allocation, and risk management.

**Integration with Other Existing Systems:**

The system for allocating courses and labs must integrate with other systems already in place, including student information systems, learning management systems, and administrative systems. To guarantee project success, the integration must be seamless and the data must be consistent.

1. **Knowledge Areas Required:**

The development of a "course and lab allocation system" project may involve the following fields of study.

* Object-oriented programming
* Database design and management
* Design and Analysis of Algorithms
* Operating systems and computer networks
* Data Structures
* Software testing and quality assurance
* Web application development
* Software testing and quality assurance
* Human-computer interaction (HCI)
* Mobile application development
* Project management and software development life cycle

Depending on the specific requirements of the project, other areas of study such as machine learning, artificial intelligence, data analytics, natural language processing, decision science or security may also be relevant.

1. **Learning Outcomes:**

After completing this project, we would become experts in python and would become good back end developers in it as it was our main back end language. Having good know-how of front end development, this project will further help us strengthen our skills in html, php, javascript and css language. We would become skillful web developers and would easily do the connectivity aspect of the web pages which has been the main aspect of any of the software development. Working throughout this project, a good and thorough understanding is developed in us about the steps involved in complete development of the software that is reliable and is maintainable with the changing situations.

Other than the learning of language, this project would boost our confidence to deal with the customers at a high level, having meetings with them, knowing their requirements and implementing that with our good coding skills. This will help us in industry to deal with situations where web based project requirements have to be done and completed in a given time after communicating efficiently with the customers.

It will also enhance our knowledge of how to design an application given a set of requirements as this is the most important aspect of software development. Once this is decided and validated by the stakeholders, the development can easily be done.

1. **Nature of end product:**

The end product would be a web based application. It would consist of many web pages that would deal with the issues faced by the instructors at educational institutes. The web pages would facilitate the instructors to choose their most preferred courses from the given options, similarly the other web page will provide the options to the instructor to choose an appropriate venue for them provided with some available venues. There would be separate options for them to choose for lecture and for lab. It would show the free time slots to the instructor for delivering lectures or helding the lab. Thus the instructor would choose from them, however all this would be on the basis of first come first serve as many instructors may wish to choose the same options from among given. All these web pages would be effectively connected to each other and would be represented in the form of graphs and diagrams to make the instructors easily choose from among the available options.

1. **Software Process Model:**

Agile methodology is used as our software process model. We have chosen to use this because it responds to the change of environment quickly which we require every time after having a meeting with our instructor. Moreover it also emphasizes on producing software quickly so the university does not have to wait for a long time for the development of software. It focuses on coding rather than documentation and focuses on team level so the risk of incorrect work is less.As a self organizing group, we also have to discuss the completed tasks and the due tasks on a daily basis. It gives priorities to the user requirement, as the user is involved with the developer so within less time an appropriate and correct software is made. This is the requirement for our project as well as we primarily focus on dealing with the dynamic environment within a given time.

1. **Initial Literature Survey:**

We aim to improve the web application for our instructors by automating the different facilities provided to the instructors and students. It gives the idea of using databases that connect with our website and provide different options in which we have an appropriate schedule for the instructor's timetable and venue allocation.

(Abdul Qadeer Khan, 27 Jan 2021) From this article the project for the selection of the appropriate time table for both students and instructors is done manually. That is by recording the information of the number of courses, available free time slots, number of courses to be assigned to part time or full time instructor and the preferred courses for the instructor is recorded and appropriate time table for instructor is chosen through a mathematical model and calculation. Similar procedure is followed for the students by recording the available and clashing free slots for them. Their results are recorded to make an appropriate time table. This is very time consuming work as it involves going through the whole data thoroughly which has a lot of risk of data to be missed or wrong data fed.

Another article of Dorien (F.T.F. Meijer Cluwen BSc, May 1, 2015) discusses the challenges phased for classroom allocation to instructors. The most important points for the room allocation are time slots of a specific length, space required, the event required i.e lecture or lab, time horizon for which classroom is required i.e day, week, semester etc. Thus to deal with such situations linear programming for assigning classrooms to instructors. Decision variables are involved here which are used to construct equation for objective function and set of constraints

by ensuring that the demands and the wishes of the user are fulfilled. After the construction of equations different calculations are made which involve the graphical calculation. The output of this is the best found room allocation for the given input.

An article by (MOHAMED AHMED SHEIKH, UNIVERSITI UTARA MALAYSIA 2012) states the involvement of different languages while developing the web based application for project development. They have used a Java Servlet page (JSP) with MySQL for the database in coding for the software. Database is always involved in the coding as that is the way through which we access the data for which we have to generate timetable, lab and course venue and the course registration. However the language used is outdated for quite a long time. However this was a good development for lecturer registration time.

However the software development shall use the most recent language which is python that we are using in our project. The involvement of databases in our project is done through use of sql which is connected to our website, this is not yet used by the analysis of literature surveys.