System Design and Implementation of Project-Thesis Management System

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APPROVAL

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DECLARATION

We, hereby, declare that the work presented in this report is the outcome of the investigation performed by us under the supervision of **Khadija Islam, Lecturer,** Department of Computer Science and Engineering, Sonargaon University, Dhaka, Bangladesh. We reaffirm that no part of this project has been or is being submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

Project-Thesis Management System is a cloud-based system by which research-based institutions like universities, colleges, and other institutions can assign, trace, and publish all the tasks of a project thesis. With our system, a team can organize all of the details of a work in one place, share feedback and progress, and ultimately collaborate more effectively. It also establishes communication between students and supervisors. Thinking of a project or thesis as a collection of tasks to accomplish a specific goal. Our system can help a team plan, manage, and execute work in order to meet a project or thesis requirements on time.

The main purpose of this system is to develop an online communication platform between supervisors and students. For example, we can say during COVID-19 when an online-based education system created a great challenging environment in the field of education. In that case, if we had a project-thesis management system, it would have solved our project and thesis management problems.

A supervisor or admin can get a clear idea about the completed projects and also ongoing projects and theses. The system's public website is for all, where completed projects and theses will be published for reading or analysis.

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LIST OF ABBREVIATIONS

CSS	Cascading Style Sheets
ECMA	European Computer Manufacturers Association
ERD	Entity Relational Diagram
HTML	Hyper Text Markup Language
IT	Information Technology
ITIL	Information Technology Infrastructure Library
MVC	Model View Controller
NFR	Non-functional requirements
PHP	Hypertext Preprocessor
PTMS	Project-Thesis Management System
ROI	Reduced risk and faster
SOA	Service Oriented Architecture

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CHAPTER 1

INTRODUCTION TO PROJECT-THESIS MANAGEMENT SYSTEM

1.1 Introduction

Project-Thesis Management System is a cloud-based system by which research-based institutions like universities, colleges, and other institutions can assign, trace, and publish all the tasks of a project thesis. With our system, a team can organize all of the details of a work in one place, share feedback and progress, and ultimately collaborate more effectively. It also establishes communication between students and supervisors. Thinking of a project or thesis as a collection of tasks to accomplish a specific goal. Our system can help a team plan, manage, and execute work in order to meet a project or thesis requirements on time.
A supervisor or admin can get a clear idea about the completed projects and also ongoing projects and theses.

The system's public website will be opened for all where completed projects and theses will be published for reading or analysis.

1.2 Motivation

A huge number of projects and theses have been done every year in universities and research-based institutions. The system will play an important role in that kind of institution in capability integration and leadership capacity development. As a consequence, the area of research and project management is becoming increasingly important for universities and research-based institutions.

The main purpose of this system is to develop an online communication platform between supervisors and students. For example, we can say during COVID-19 when an online-based education system created a great challenging environment in the field of education. In that case, if we had a project-thesis management system, it would have solved our project and thesis management problems.

1.3 Objectives

1. We are developing an online-based communication system or management between students, supervisors, and administration.
2. Every year, students from a university of different departments can allocate their projects and thesis papers by using this system, and from that, junior students can play a vital role in their project or thesis making and report writing by gathering various knowledge.
3. With this system, the supervisor can allow his group members to complete various types of tasks for a specific period of time. When the work of the group members is done, it will

come to the supervisor very easily through online-based management. He can easily evaluate the performance of the team from those projects or thesis papers.

4. Creating a workflow system from which supervisors can measure the individual performance of team members across departments and he can give them a clear direction as per the progress of the work.

1.4 Problem Statement

In this project book, our desired goal is to build a system where students and supervisors can easily communicate with each other and also to create a medium where the project papers prepared by the students of all the departments of a university every year are stored in single management as well.

In final-year project defense, proper communication management between students and supervisors is very essential but often various obstacles and problems may arise in this regard. Examples include flood-affected areas or quarantine periods when direct communication between students and supervisors was quite impossible. Unfortunately, the supervisors were not able to evaluate the individual progress of the students. Moreover, a management deficiency can also be seen where it is very difficult for new students to collect all the previous projects and thesis papers.

Considering all these problems we try to create a system called the "Thesis or Project Manager" system where it is possible to solve all such problems. It is a system where students and supervisors can easily communicate even from a long distance. Is it just that? No, apart from that, it is possible to collect all the previous Thesis and project papers through this system. In this way, the students can complete their work from a certain distance and also helps the supervisors from additional stress (see the student's individual performance & progress through one single system).

CHAPTER 2

BACKGROUND AND SYSTEM DEVELOPMENT PROCESS

2.1 Related Works

This is a system that we've made for the first time in our Country. This software will make a revolutionary change in doing projects and thesis. It will make a better and easier interconnection between the teachers and students. This system allows teachers to create project theses according to the group team of students and individually assign them a task for a certain period of time. Teachers can also check the update and processes throughout this system, by which their work will be done more efficiently. The list of the completed project will be also included in this system so that the newcomers can get a clearer idea about project theses and how they should be done. Just by browsing this system teachers and students can take confidential ideas about project theses, and they can easily use it for their Personal project theses. following are the things that teachers and students can get from this system. The idea of creating a new project. student's work update. this system comes with two different motives. The first one is that this system would help students and teachers for doing their job more efficiently and the second one is that anyone can easily browse this system from anywhere in the world. by using this system, teachers can easily look after students' work progress, and make them more active in their work. Since this system has a chatting system, so Teachers can easily warn students in case they make any mistakes, and through this system, teachers can control everything students can ask for help from teachers by using this system. This system will change the total Process of the project & thesis and will make it easier for students and teachers. If a student is not Featured the teacher can take action against that student through this system and the teacher can see how much the student is working.

2.2 Providing Background Information

The supervisor can easily control everything through the system, The supervisor can easily see how much work a student is doing, and Students can easily create groups When students create a group, a request will be sent to the supervisor If the supervisor accepts, then the supervisor can work on projects under.

2.3 System Development Process: Agile Process

“The meaning of Agile is swift or versatile. “The Agile Process Model" refers to a system development approach based on iterative development” [1]. Agile methods break tasks into smaller

iterations or parts that do not directly involve long-term planning. The project scope and requirements are laid down at the beginning of the development process. Plans regarding the number of iterations, the duration, and the scope of each iteration are clearly defined in advance.

Each iteration is considered as a short time "frame" in the Agile process model, which typically lasts from one to four weeks. The division of the entire project into smaller parts helps to minimize the project risk and to reduce the overall project delivery time requirements. Each iteration involves a team working through a full system development life cycle including planning, requirements analysis, design, coding, and testing before a working product is demonstrated to the client.

1. Requirements gathering: In this phase, you must define the requirements. You should explain business opportunities and plan the time and effort needed to build the project. Based on this information, you can evaluate technical and economic feasibility.
2. Design the requirements: When you have identified the project, work with stakeholders to define requirements. You can use the user flow diagram or the high-level UML diagram to show the work of new features and show how it will apply to your existing system.
3. Construction/ iteration: When the team defines the requirements, the work begins. Designers and developers start working on their project, which aims to deploy a working product. The product will undergo various stages of improvement, so it includes simple, minimal functionality.
4. Testing: In this phase, the Quality Assurance team examines the product's performance and looks for the bug.
5. Deployment: In this phase, the team issues a product for the user's work environment.
6. Feedback: After releasing the product, the last step is feedback. In this, the team receives feedback about the product and works through the feedback.

2.3.1 Benefits of Agile

The Agile method has gained momentum as a top choice for leaders and developers alike. And it’s no surprise that’s why. Here are just a few key benefits of Agile project management and Agile development [2].

1. Greater stakeholder engagement and collaboration

   Agile encourages a high degree of input and collaboration between the client and the development team. This leads to happier clients because there is transparency throughout the process and developers are better informed on client needs and wants.

2. Predictable costs and scheduling

   By breaking down the development process into iterative sprints, project managers can more accurately estimate costs and set clear predictable timelines. This makes stakeholders

happier because they know what to expect and can plan budgets and marketing strategies more precisely. It also makes the development process easier for teams because they can focus on delivering quickly and reliably and test systems regularly for quality and efficacy.

3. Flexibility amidst change

   Agile project management is all about being nimble so teams can adapt to changes quickly while reducing sunk costs. Agile allows teams to pivot due to changing client needs, shifts in market demands, or in response to evolving product requirements. This gives teams the flexibility to refine and prioritize the product backlog so that they are always delivering high-quality, relevant products on time and on budget.

4. Higher quality products

   Agile product development integrates regular testing into the development process. This makes it easier for the product owner to identify any issues early on and make changes as needed. The result is higher quality products that are relevant and thoroughly vetted.

5. Reduced risk and faster ROI

   Agile reduces risk because it regularly tests and allows for change mid-development. By iterating on a project step by step (instead of moving forward with a rigid end-to-end project plan), teams are able to predictably produce viable products. If they discover an issue mid-project, they can quickly adjust course rather than finding out at the end of the whole project that there are issues.

CHAPTER 3

SYSTEM REQUIREMENTS AND SPECIFICATIONS

3.1 System Requirements

Requirements engineering tools are usually system products to ease the RE processes and allow for more systematic and formalized handling of requirements, change management, and traceability.

3.1.1 Server: Apache

Apache HTTP Server is a free and open-source web server that delivers web content through the internet. It is commonly referred to as Apache and after development, it quickly became the most popular HTTP client on the web [3].

Apache is just one component that is needed in a web application stack to deliver web content. One of the most common web application stacks involves LAMP, Linux, Apache, MySQL, and PHP.

3.1.2 Backend Framework: Codeigniter 4

The backend frameworks are the collection of server-side programming languages that are used in developing the back-end structure of a website.

CodeIgniter is a famous web application framework to build dynamic websites. It is loosely based on MVC architecture since Controller classes are necessary but models and views are optional. CodeIgniter promises exceptional performance, nearly zero configuration, and no large-scale monolithic libraries [4].

Key Features of CodeIgniter Backend Frameworks:

1. Tiny Footprints – You can quickly deploy and work on updates with CodeIgniter source code with PHP syntax as the entire codebase size surge within 2MB.
2. Super-Fast – Both the users and developers love an application that loads fast. Undoubtedly being a developer, you have tried many other frameworks. But, compared to those, CodeIgniter uploaded files in less than 50ms.
3. MVC Architecture – We have already mentioned above that the CodeIgniter framework uses the Model-View-Controller architectural design. The MVC is the industry standard practice that separates the data, business logic, and presentation in web applications.
4. Built-in Components – CodeIgniter has in-built application-specific components that allow developers to send an email, database management, session management, and many more without any hassle.

5. Remarkable Documentations – The CodeIgniter framework is well documented. Also, the vast ecosystem of PHP users makes it easy for beginners to understand CodeIgniter in the simplest ways. Apart from that, you will get easy solutions for CodeIgniter frameworks from GitHub and Stack overflow.

3.1.3 Language: PHP 7.4.3

PHP is a popular general-purpose scripting language. It is used for web development. It was created by Rasmus Lerdorf in 1994, the PHP reference implementation is now produced by the PHP Group [5].

PHP 7.4 Update 2019: New features from time to time are very essential and important for any language to grow. PHP has been one of the most popular languages for many years and one main reason for that is they keep on updating it and adding new features to it from time to time. The performance of PHP from its initial release is far better nowadays. Also, PHP is one of the top 10 most popular programming languages.

Advantages of PHP

PHP has some advantages that have made it so popular, and it's been the go-to language for web servers for more than 15 years now. Here are some of PHP's benefits:

1. Cross-Platform: PHP is platform-independent. You don't have to have a particular OS to use it because it runs on every platform, whether it's Mac, Windows, or Linux.
2. Open Source: PHP is open source. The original code is made available to everyone who wants to build upon it. This is one of the reasons why one of its frameworks, Laravel, is so popular.
3. Easy to learn: PHP is not hard to learn for absolute beginners. You can pick it up pretty if you already have programming knowledge.

PHP syncs with all Databases: You can easily connect PHP to all Databases, relational and non-relational. So, it can connect in no time to MySQL, PostgreSQL, MongoDB, or any other database.

Supportive Community: PHP has a very supportive online community. The official documentation provides guides on how to use the features and you can easily get your problem fixed while stuck.

3.1.4 Database: MySQL (MariaDB 10.4.11)

MariaDB is a community-developed, commercially supported fork of the MySQL relational database management system (RDBMS), intended to remain free and open-source software under the GNU General Public License. Development is led by some of the original developers of MySQL, who forked it due to concerns over its acquisition by Oracle Corporation in 2009.

MariaDB is intended to maintain high compatibility with MySQL, with library binary parity and exact matching with MySQL APIs and commands, allowing it in many cases to function as a drop-in replacement for MySQL. However, new features are diverging. It includes new storage engines like Aria, Column Store, and My Rocks [6].

MariaDB 10.4 is the current stable series of MariaDB. It is an evolution of MariaDB 10.3 with several entirely new features not found anywhere else and with backported and reimplemented features from MySQL.

3.1.5 Frontend Framework: Bootstrap 4

Bootstrap is a free front-end framework for faster and easier web development

Bootstrap includes HTML and CSS-based design templates for typography, forms, buttons, tables, navigation, modals, image carousels, and many others, such as well as optional JavaScript plugins

Bootstrap also gives you the ability to easily create responsive designs

Advantages of Bootstrap:

1. Easy to use: Anybody with just basic knowledge of HTML and CSS can start using Bootstrap
2. Responsive features: Bootstrap's responsive CSS adjusts to phones, tablets, and desktops
3. Mobile-first approach: In Bootstrap, mobile-first styles are part of the core framework
4. Browser compatibility: Bootstrap 4 is compatible with all modern browsers (Chrome, Firefox, Internet Explorer 10+, Edge, Safari, and Opera)

3.1.6 JavaScript

JavaScript is a dynamic computer programming language. It is lightweight and most commonly used as a part of web pages, whose implementations allow client-side scripts to interact with the user and make dynamic pages. It is an interpreted programming language with object-oriented capabilities [7].

JavaScript was first known as Live Script, but Netscape changed its name to JavaScript, possibly because of the excitement being generated by Java. JavaScript made its first appearance in Netscape 2.0 in 1995 with the name Live Script. The general-purpose core of the language has been embedded in Netscape, Internet Explorer, and other web browsers.

The ECMA-262 Specification defined a standard version of the core JavaScript language.

1. JavaScript is a lightweight, interpreted programming language.
2. Designed for creating network-centric applications.
3. Complementary to and integrated with Java.

4. Complementary to and integrated with HTML.
5. Open and cross-platform.

The advantages of JavaScript are:

Less server interaction − You can validate user input before sending the page off to the server. This saves server traffic, which means less load on your server.

Immediate feedback to the visitors − They don't have to wait for a page reload to see if they have forgotten to enter something.

Increased interactivity − You can create interfaces that react when the user hovers over them with a mouse or activates them via the keyboard.

Richer interfaces − You can use JavaScript to include such items as drag-and-drop components and sliders to give a Rich Interface to your site visitor framework.

3.1.7 Frontend Library: jQuery

jQuery is one of the most popular JavaScript libraries out there. jQuery makes web development easier by overcoming all the “stuff” that makes JavaScript difficult to use. With jQuery, you can call simple methods instead of rewriting Specifications

jQuery is a lightweight, open-source JavaScript library that helps us build interactive web pages with animations, visual effects, and advanced functionality. It is the most popular JavaScript library, used by around 70 million websites worldwide [8].

The jQuery motto is “write less, do more”, because it reduces many lines of raw JavaScript code into a single line with its simple interface. The main features of jQuery include

1. Event Handling
2. DOM Manipulation
3. Animations and Effects
4. AJAX framework.

3.1.8 HTML

1. HTML stands for Hyper Text Markup Language [9].
2. HTML is the standard markup language for creating Web pages
3. HTML describes the structure of a Web page
4. HTML consists of a series of elements
5. HTML elements tell the browser how to display the content.

3.1.9 CSS

CSS is used to define styles for your web pages, including the design, layout, and variations in display for different devices and screen sizes.

1. CSS stands for Cascading Style Sheets
2. CSS describes how HTML elements are to be displayed on the screen, on paper, or in other media.
3. CSS saves a lot of work. It can control the layout of multiple web pages all at once.
4. External stylesheets are stored in CSS files.

3.2 Functional Requirements

Functional Requirements are product features or functions that developers must implement to enable users to accomplish their tasks. So, it's important to make them clear both for the development team and the stakeholders or users. Generally, functional requirements describe system behavior under specific conditions [10]. All of the functional requirements of this system are

3.2.1 Registration

Student and supervisor registration by asking for access to the system by giving information of academics and professionals such as department name, Section, Academic ID, and most importantly valid email address, and password.

3.2.2 Email Confirmation

The system sends emails using the Gmail platform to send approved and declined messages. Also, schedule notice for groups or group individuals.

3.2.3 System Panels User-wise

There will be 3 user panels and a public website. Where specific users of the specific panel will do their work.

3.2.4 Group Creation

Group must include a group name, description, and a group supervisor. This group can have a minimum of one member and a maximum of five members under a specific supervisor.

A supervisor can run a maximum of six groups at a time. The admin will manage all activities of the group and all the details of the group can be viewed by three types of user panels.

3.2.5 Project-Thesis with Group

Here, must be mentioned group name, type, thesis or project, and description. Three types of user panels (admin, supervisor, and student) can create the projects and they can view all details of this project.

3.2.6 Project-Thesis Module

Modules must be created under a specific project and modules must contain project names and descriptions. Students can create new modules and add existing modules.

3.2.7 Project-Thesis Section and Section Assign

Sections must be created under a specific module. Specific students will be assigned to work in the section by the supervisor and admin and all user panels can view section details.

3.2.8 Publish Final Project-Thesis

Here the student will submit the project and the completed project will be approved by the supervisor. And finally, the completed project can be published by the admin. All types of user panels can see the project or thesis list.

3.2.9 Group Schedule

Admin and supervisor will create schedules and groups will get the notification through email.

3.2.10 Search or Study Published Project-Thesis

Any user or visitor with this system's public URL address can see recently published projects on the home page. After that, they can also search department-wise projects and theses.

3.3 Non-functional requirements (NFR)

Non-functional requirements define the overall qualities or attributes of the resulting system and also place restrictions on the product being developed, and the development process, and specify external constraints that the product must meet [10]. Some Non-functional requirement examples.

3.3.1 Response time and net processing time capacity

Response time testing is a measurement of the amount of time that passes between a user's request and a response from the server, application, website, or device. For example, if a user submits a request to an application to load a specific web page, the response time is how much time it takes for the app to fulfill that request. This is typically only a few nanoseconds of time, but with slower websites or applications, it might be several seconds or even minutes. Measuring response times helps developers determine whether software and websites meet the basic needs of their users and if they're responsive enough to deliver a final product. Faster response times often mean more pleased customers and a good rating for the software or website. Slower response times might mean the development team needs to address errors, hardware issues, or connectivity projects.

3.3.2 Agreements Maintainability

A software maintainability measurement is a rating used to assess the amount of effort or resources currently committed to an application. Automated solutions offer an accurate, objective way to measure each program. They supply a benchmarking measurement for reducing application complexity, improving quality, and mitigating risk as an application is created, enhanced, or maintained. Automated analysis is a viable, cost-effective approach to identifying software maintainability issues and determining what actions should be taken to reduce programming efforts or costs.

Developing maintainable software is like picnicking. Once you're finished, leave your spot as you would like to find it yourself, or leave it in a better state than you found it! There are a number of principles, approaches, and techniques that can help you develop maintainable software. Many of these are generally applicable to writing good software:

1. Design for maintainability from the outset
2. Iterative development and regular reviews help to improve quality - see the section below
3. Readable code is easy to understand ("write programs for people")
4. Refactor code to improve its understandability
5. Relevant documentation helps developers understand the software
6. The automated build makes the code easy to compile
7. Automated tests make it easy to validate changes
8. Continuous integration makes the code easier to build and test
9. Version control helps keep code, tests, and documentation up-to-date and synchronized
10. Change the way you work to make maintainability a key goal.

3.3.3 Security

Security Testing is a type of Software Testing that uncovers vulnerabilities, threats, and risks in a software application and prevents malicious attacks from intruders. The purpose of Security Tests is to identify all possible loopholes and weaknesses of the software system which might result in a loss of information, revenue, and reputation at the hands of the employees or outsiders of the Organization.

The main goal of Security Testing is to identify the threats in the system and measure its potential vulnerabilities, so the threats can be encountered and the system does not stop functioning or cannot be exploited. It also helps in detecting all possible security risks in the system and helps developers to fix the problems through coding.

Types of Security Testing:

There are seven main types of security testing as per the Open-Source Security Testing methodology manual. They are explained as follows:

1. Vulnerability Scanning: This is done through automated software to scan a system against known vulnerability signatures.
2. Security Scanning: It involves identifying network and system weaknesses, and later provides solutions for reducing these risks. This scanning can be performed for both Manual and Automated scanning.
3. Penetration testing: This kind of testing simulates an attack from a malicious hacker. This testing involves the analysis of a particular system to check for potential vulnerabilities to an external hacking attempt.
4. Risk Assessment: This testing involves the analysis of security risks observed in the organization. Risks are classified as Low, Medium, and High. This testing recommends controls and measures to reduce the risk.
5. Security Auditing: This is an internal inspection of Applications and Operating systems for security flaws. An audit can also be done via line-by-line inspection of code
6. Ethical hacking: It's hacking an Organization's Software systems. Unlike malicious hackers, who steal for their own gains, the intent is to expose security flaws in the system.
7. Posture Assessment: This combines Security scanning, Ethical Hacking, and Risk Assessments to show an overall security posture of an organization.

3.3.4 System management

Systems management is the administration of information technology (IT) systems in an enterprise network or data center. An effective systems management plan facilitates the delivery of IT as a service and allows an organization's employees to respond quickly to changing business requirements and system activity. In a hybrid IT environment, this involves overseeing the design and day-to-day operations of the data center. It also includes oversight of the integration of third-party cloud services.

The chief information officer or chief technology officer usually oversees IT systems management. The department responsible for architecting and managing the system is sometimes known as management information systems, information systems, or IT infrastructure and operations. Tasks for these teams include the following:

1. Gathering system requirements.
2. Buying equipment and software.
3. Distributing, configuring, and maintaining the equipment.
4. Providing enhancements and service updates to equipment.
5. Implementing processes to address problems.
6. Provisioning services.
7. Monitoring IT systems performance.
8. Determining whether objectives are being met.

The Information Technology Infrastructure Library (ITIL) provides a best practice guide for operations and systems management in the data center and cloud.

3.3.5 Application Architecture

Application architecture is a structural map of how an organization's software applications are assembled and how those applications interact with each other to meet business or user requirements. An application architecture helps ensure that applications are scalable and reliable, and assists enterprises identify gaps in functionality.

In general, application architecture defines how applications interact with entities such as middleware, databases, and other applications. Application architectures usually follow software design principles that are generally accepted among their adherents but may lack formal industry standards.

One of the most notable application architectures is the service-oriented architecture (SOA), which emerged in the 1990s as application integration and component-sharing operations became linked to pools of hosting resources and distributed databases. Over the past 20 years, SOA has evolved into several other architectures, most notably microservices architecture.

Benefits of application architecture:

Overall, application architecture helps IT and business planners work together so that the right technical solutions are available to meet the business objectives. More specifically, application architecture:

1. Reduces cost by identifying redundancies, such as the use of two independent databases that can be replaced by one.
2. Improves efficiency by identifying gaps, such as essential services that users can't access through mobile apps.
3. Creates an enterprise platform for application accessibility and third-party integration.
4. Allows for interoperable, modular systems that are easier to use and java point.
5. Helps architects "see the big picture" and align software strategies with the organization's overall business objective.

3.3.6 Support and maintenance

While these two terms are often viewed as one and the same, the difference between support and maintenance can be broken down by the urgency in their approaches. While software support is defined as fixing broken software (or “bugs”) with reactive development, software maintenance is defined as proactive development in adding additional features or triaging low-priority “bugs” that don’t deteriorate the software design and user experience. Software maintenance can be broken down into four main categories:

1. Corrective Maintenance

Often referred to as “bug” maintenance, corrective maintenance can be defined as correcting user-reported errors in source code. This is the most urgent type of software maintenance, but, unlike support, focuses on low-priority “bugs” and is commonly regarded as triaging enhancement requests rather than fixing defects.

2. Preventive Maintenance

As its name suggests, preventive maintenance is the practice of taking preventive measures to ensure software continues running as it should. Preventive maintenance focuses on decreasing the likelihood of unanticipated effects of evolving operating systems and devices on which the software runs.

3. Perfective Maintenance

Focused on iteration, perfective maintenance is defined as engineering after delivery in order to elevate the functionality and/or performance of the software. Spurred by user feedback, perfective maintenance accounts for the implementation of new features based on user submissions.

4. Adaptive maintenance

is characterized by the need to alter code in one part of the software due to external problems in another part of the system. Adaptive maintenance is required when issues are caused by changes to the operating system, software dependencies, hardware, or business policies of a product, thus requiring changes to the codebase.

3.3.7. Delivery, Deployment, And Timing Requirements

Basically, software development is the creation of a website, application, or similar to fulfill a purpose and meet a user's need. At IBM they define it as follows: “Software development refers to a set of computing activities dedicated to the process of creating, designing, implementing and supporting software. The software itself is the set of instructions or programs that tell a computer what to do. It is hardware independent and makes computers programmable.”

According to the technological giant, pioneers in software development, it is divided into three main categories:

1. System software

Software that focuses on core functions such as operating systems, disk management, utilities, hardware management, and other operational-level needs.

2. Programming Software

Focuses on giving developers tools like text editors, compilers, linkers, debuggers, and all the tools they need to write code.

3. Application software

to help users perform tasks. Office productivity suites, data management software, media players, and security programs are examples.

When the project is ready, it must be delivered to the client for a first test and approval. This precise process is known as software delivery, one of the most important in creating an application or website.

“Software delivery is the entire process of bringing a software product to customers, from conceptualization, through development, to purchase and installation of the product license. In most cases, the term refers to the beginning of the process, that is, to the series of steps that the different teams of the company follow to prepare the software for its implementation in the client. In some cases, the term refers to how the customer accesses the product. explained on the Thales portal.

4. Defining system timing requirements

While the topic of timing has already been raised in previous parts of this series, the discussion here will be expanded to include the execution and response time of the software functions.

When discussing timing in embedded software, there are typically two types of timing requirements, rate of execution and response time. The rate of execution deals with the event-to-event timing within a software function. It can be the timing between changes in output, the time between samples of an input, or some combination of both.

The important thing is that the timing specification relates to the execution timing of the function only, for example, a software serial input routine that simulates a serial port. The rate of execution is related to the baud rate of the data being received. If the baud rate is 9600 baud, then the routine must be called 9600 times a second to accurately capture each bit as it is received.

3.4 System Specifications

This software allows teachers to create projects or a thesis according to the group or team of students and individually assign them a task for a certain period.

Teachers can also check the update and processes throughout this software, by which their work will be done more efficiently.

The list of completed projects will be also included in this software so that the newcomers can get a clearer idea about projects or theses and how they should be done.

CHAPTER 4

SYSTEM DESIGN

4.1 Activity Diagram

Activity Diagrams describe how activities are coordinated to provide a service that can be at different levels of abstraction [12]. Typically, an event needs to be achieved by some operations, particularly where the operation is intended to achieve a number of different things that require coordination, or how the events in a single use case relate to one another, in particular, use cases where activities may overlap and require coordination. It is also suitable for modeling how a collection of use cases coordinates to represent business workflows.

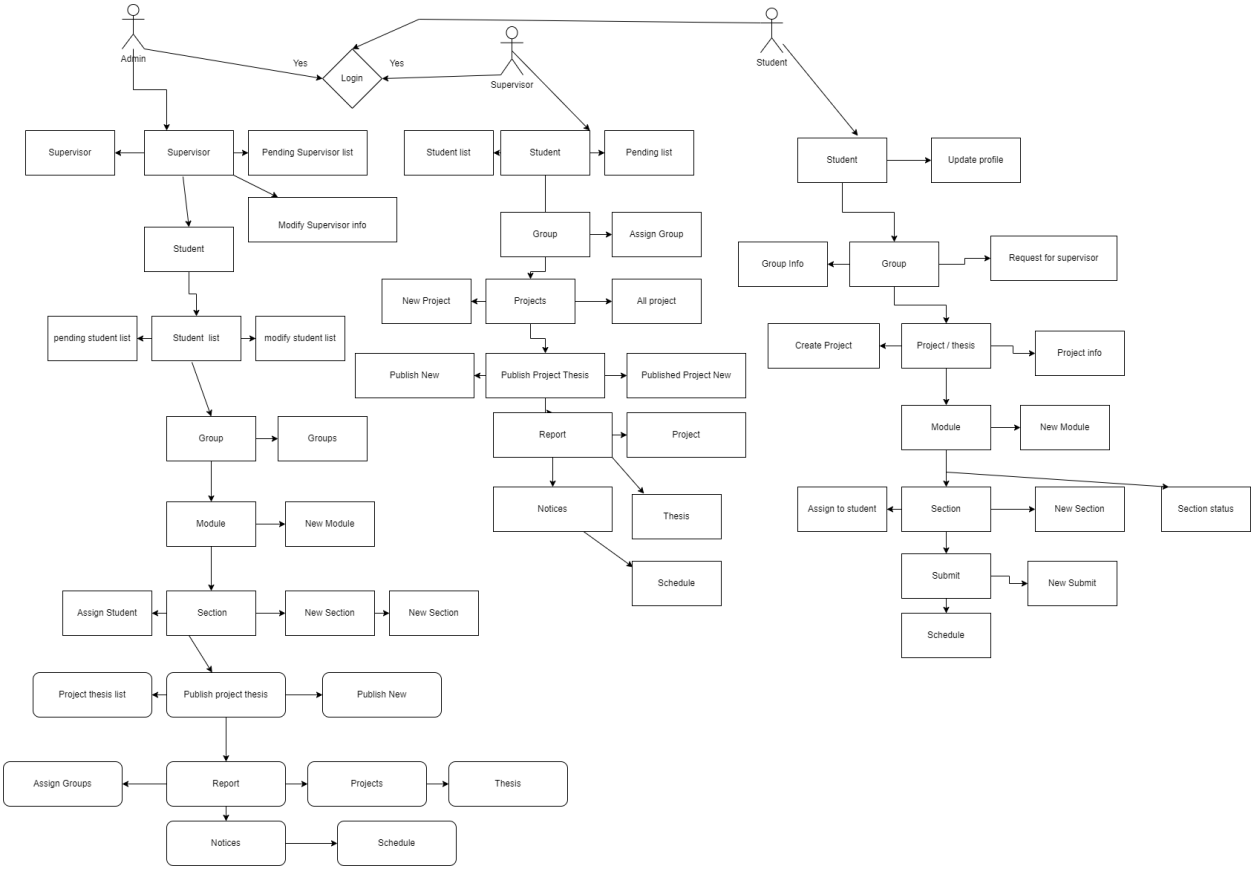

Figure 4.1 Activity Diagram

4.2 Data Flow Diagram

A data-flow diagram is a way of representing a flow of data through a process or a system (usually an information system). The DFD also provides information about the outputs and inputs of each

entity and the process itself. A data-flow diagram has no control flow — there are no decision rules and no loops. Specific operations based on the data can be represented by a flowchart.

4.2.1 Level-0: Data flow diagram

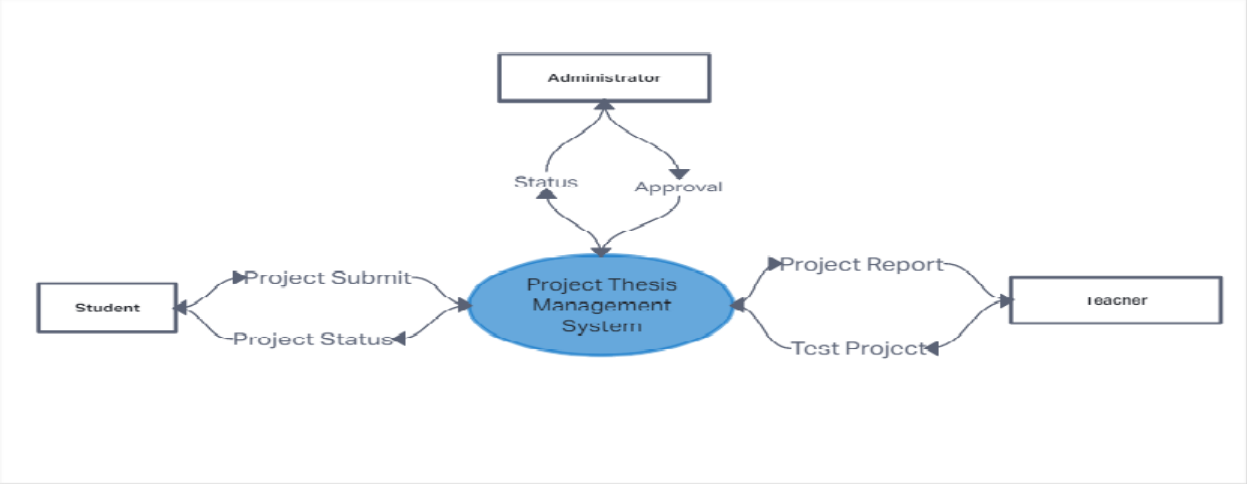

Figure 4.2 Level-0 DFD

4.2.2 Level-1: Data flow diagram

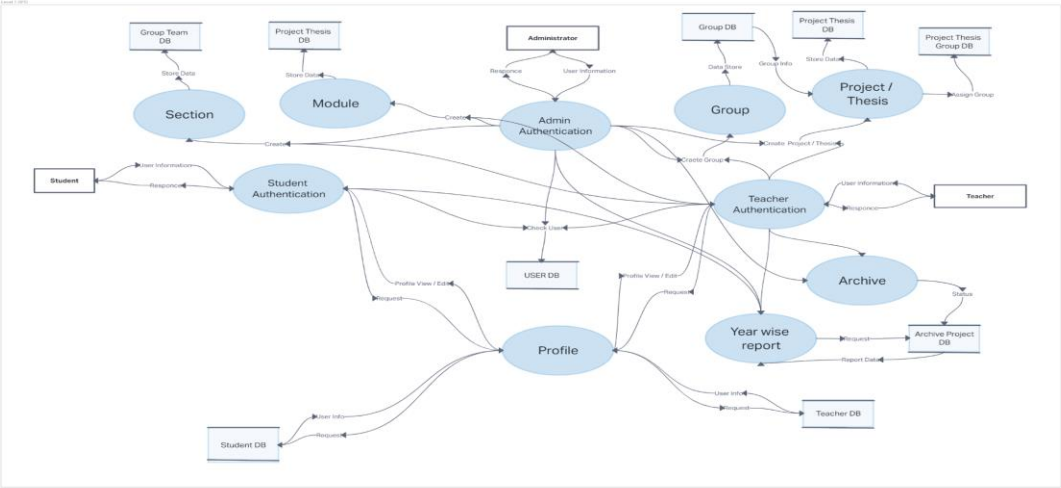

Figure 4.3 Level-1 DFD

4.3 Database Design

A properly designed database provides you with access to up-to-date, accurate information. Because a correct design is essential to achieving your goals in working with a database, investing the time required to learn the principles of good design makes sense. In the end, you are much more likely to end up with a database that meets your needs and can easily accommodate change

4.3.1 Entity Relation Diagram

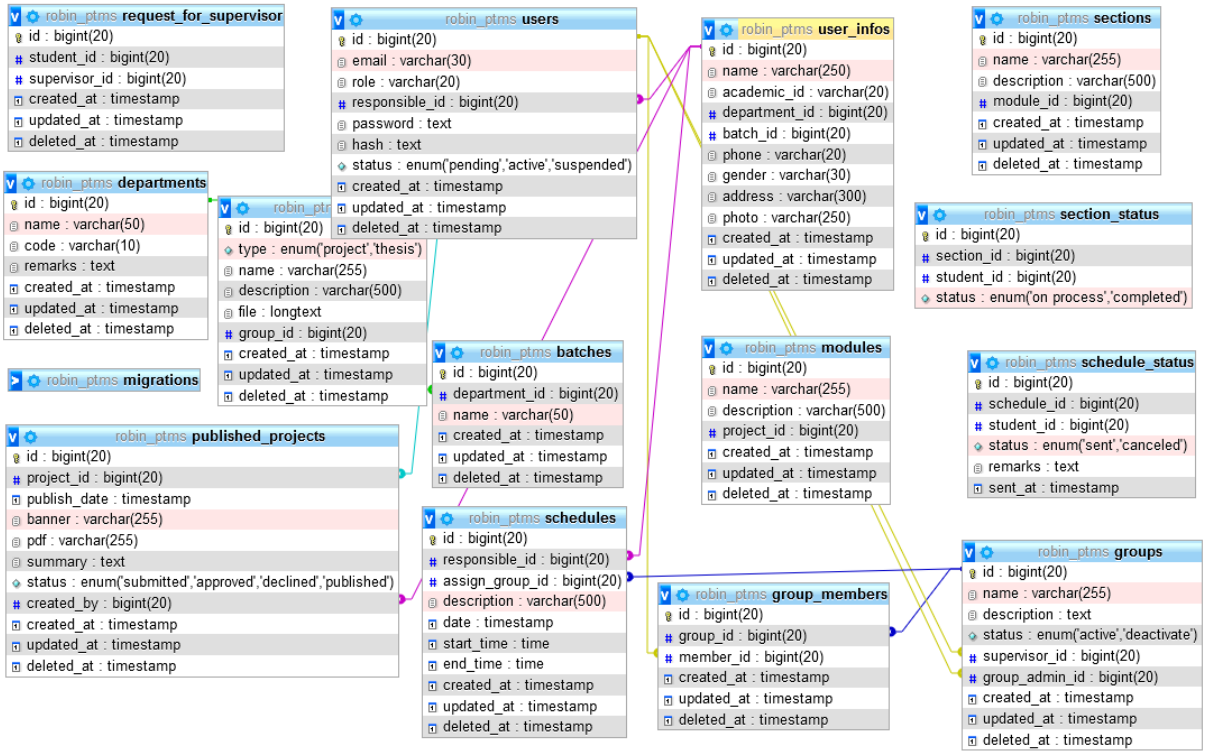

Figure 4.4 Entity Relation Diagram

4.4 Class Diagram

A class diagram describes the attributes and operations of a class and also the constraints imposed on the system. Class diagrams are widely used in the modeling of object-oriented systems because they are the only UML diagrams, which can be mapped directly with object-oriented languages.

Also shows a collection of classes, interfaces, associations, collaborations, and constraints. It is also known as a structural diagram.

In our system, we have several classes but we showing two of the most important class groups which are Controller Classes and Model classes.

4.4.1 Controller Classes

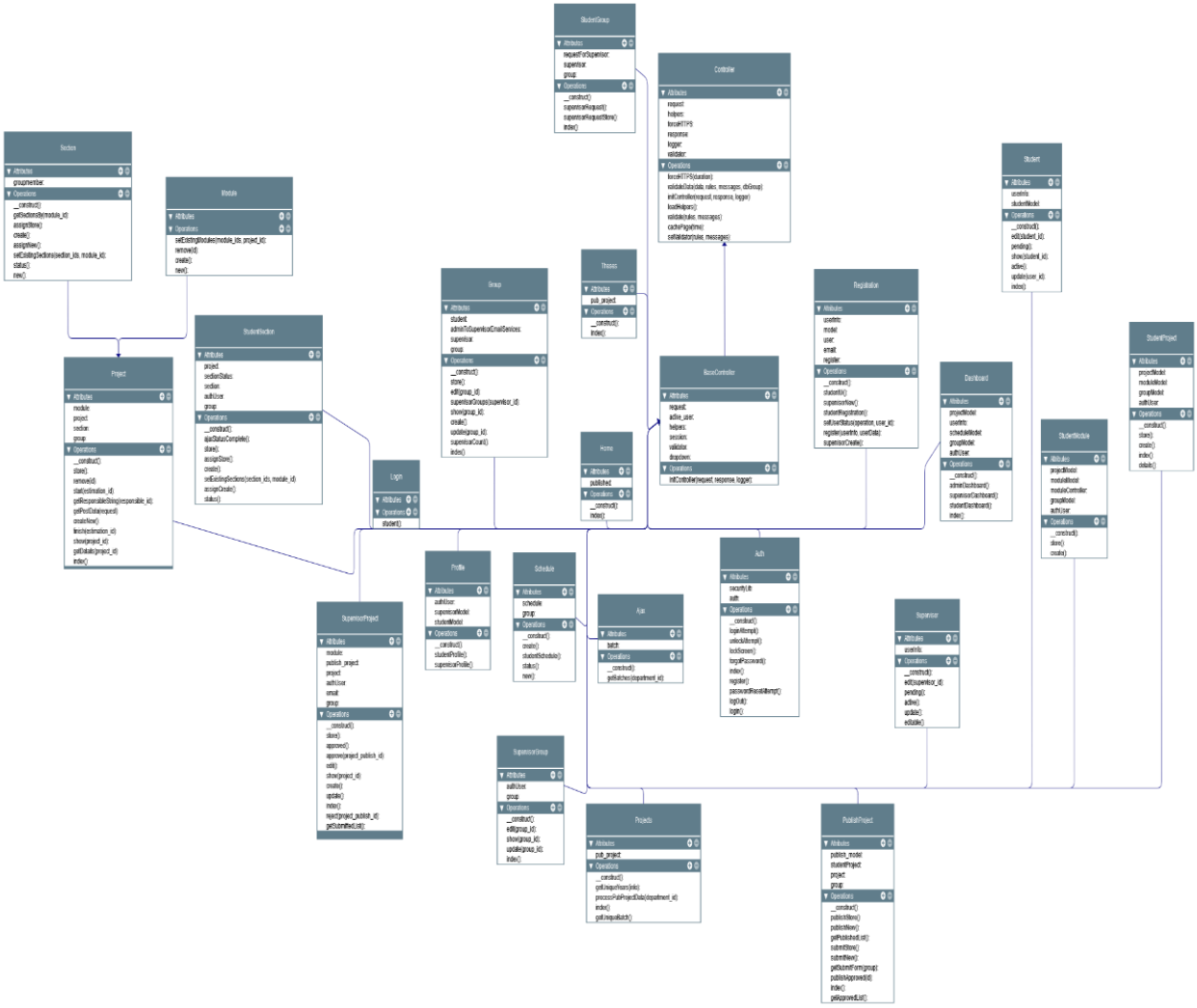

Figure 4.5 All Controller Classes

4.4.2 Model Classes

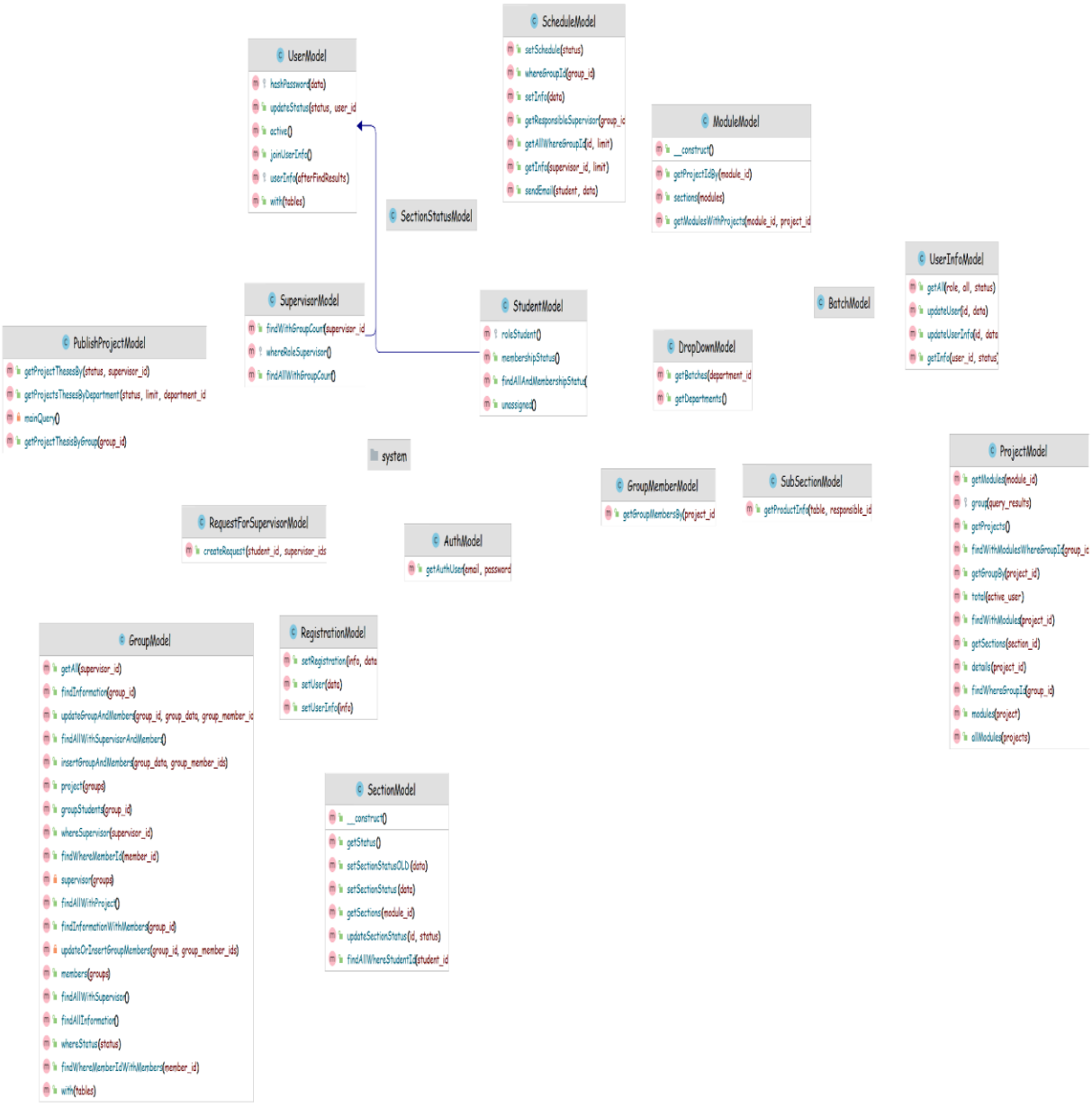

Figure 4.6 Model Classes

4.5 Use Case Diagram

A use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. The use cases are represented by either circles or ellipses. The actors are often shown as stick figures. Our use system’s use case diagram has been given below

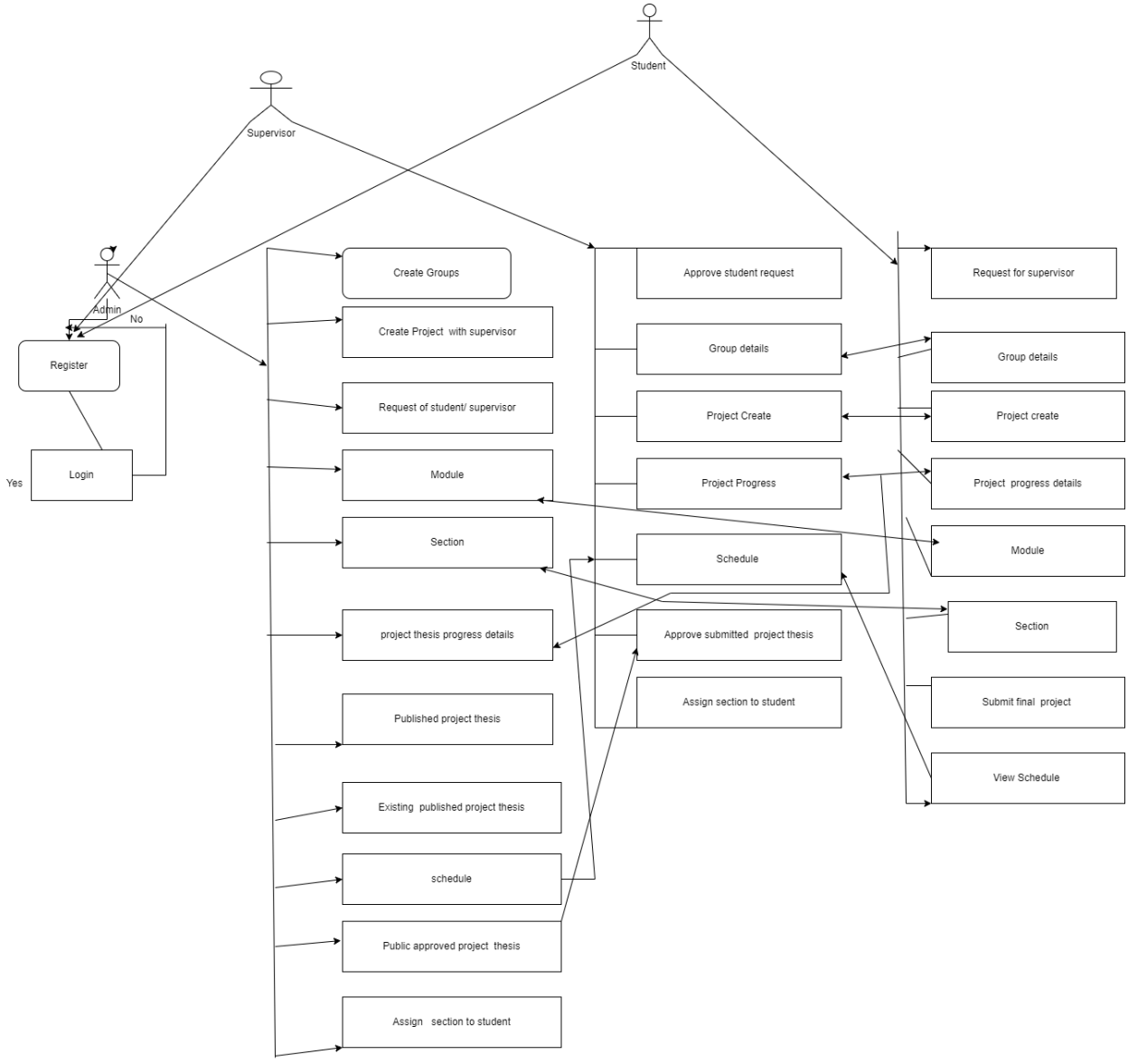

Figure 4.7 Use Case Diagram

CHAPTER 5

IMPLEMENTATION AND OUTCOME

The whole system is divided into basically four panels which are public, admin, supervisor, and student panel. All panel is specifically for specific users.

5.1 Public View

This panel is a combination of four web pages where anybody who has the system address (web URL) can browse them as their need.

5.1.1 Home page

The home page will have firstly some introduction of the system and then objectives and motivation of the system. After then will have recently published projects and theses list. Lastly the slider of group members who built the “Project-Thesis Management System”. A picture has been given below to clarify the concept of the home page

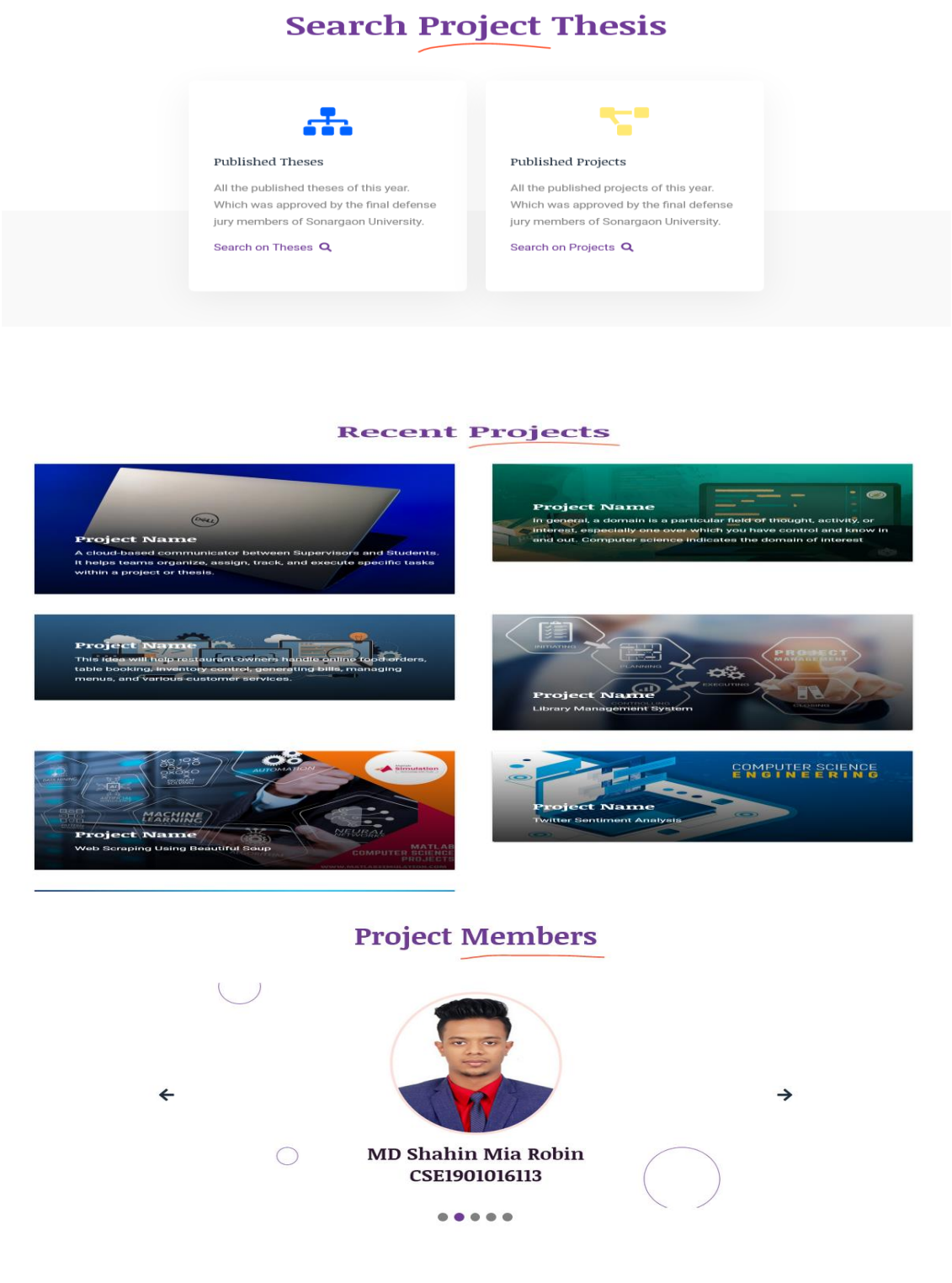

Figure 5.1 Home Page

5.1.2 Projects Page

On this mentioned page a visitor or a user can read any published projects by changing the departments dropdown. We can see in the below picture that left side we a have project list dynamically searched based on selected departments by the user. From the left side's project list if a user clicks a project, then the final project paper will be opened on the right-side area.

If any department has no published project there will be no project list.

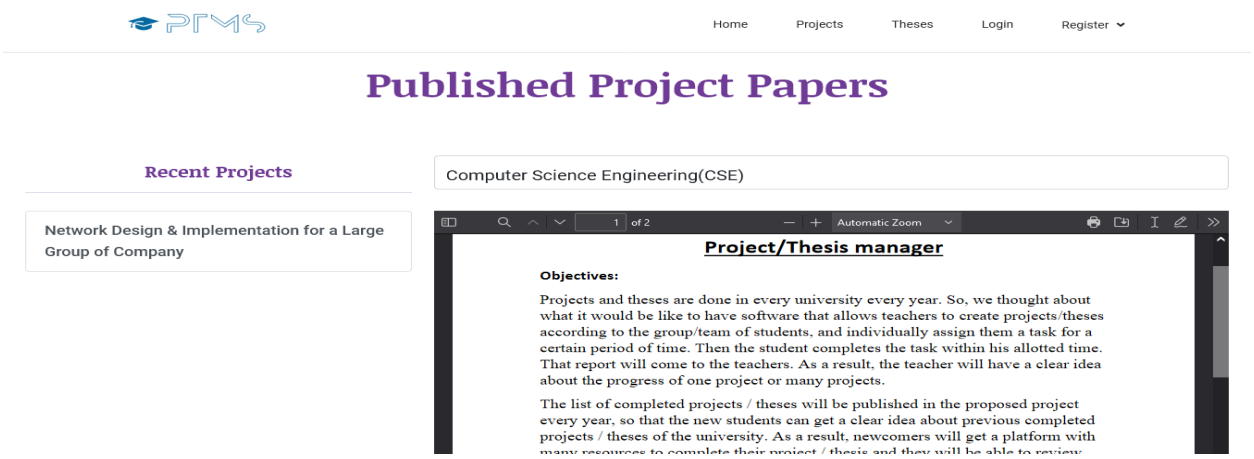

Figure 5.2 Published Project List

5.1.3 Theses Page

This page shows data as same as the projects page. As we have mentioned above. Page a visitor or a user can read any published by changing the departments dropdown. We can see in the below picture that left side we have a thesis list dynamically searched based on selected departments by the user. From the left side's thesis list if a user clicks a thesis paper, then the final thesis paper will be opened on the right-side area. If any department has no published thesis there will be no thesis list.

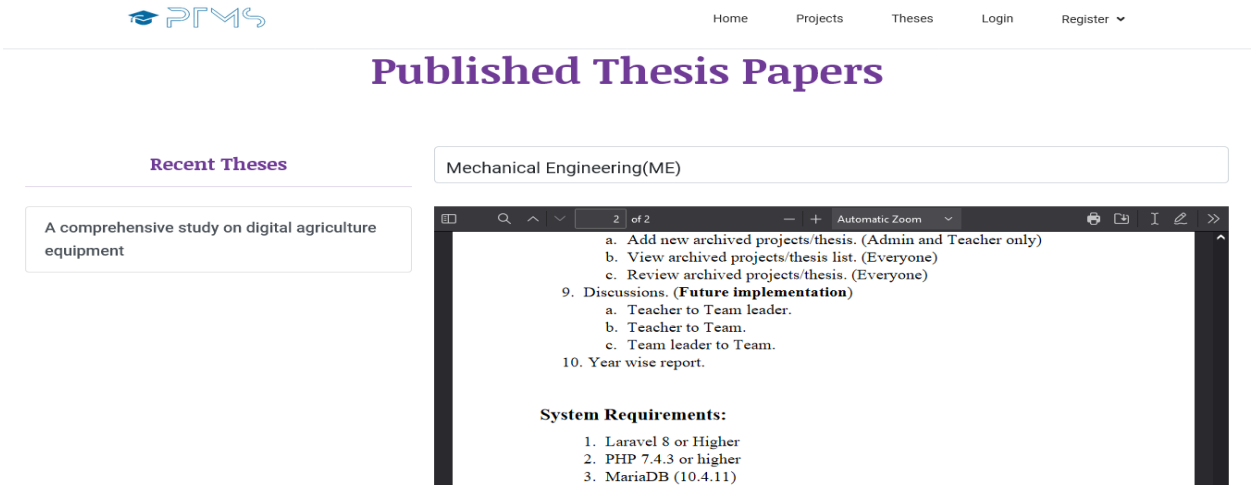

Figure 5.3 Published Thesis List

5.1.4 Login Page

This page normally will have a login form. By giving user email and passwords users will be logged into the system. There are two more buttons (student and supervisor) by clicking them a visitor can register for this system.

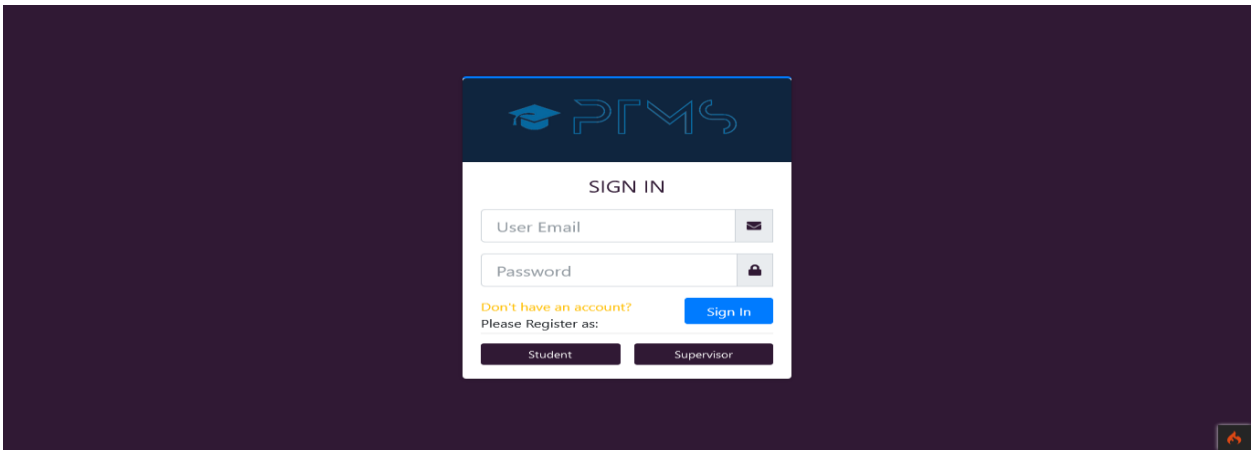

Figure 5.4 Login Page

5.1.5 Registration Page

This page will have the registration form for this system. By providing valid information a visitor can request access to the admin of this system.

5.1.6 Student Registration Form

The student registration page is for those students who will work on a project or thesis with their supervisor.

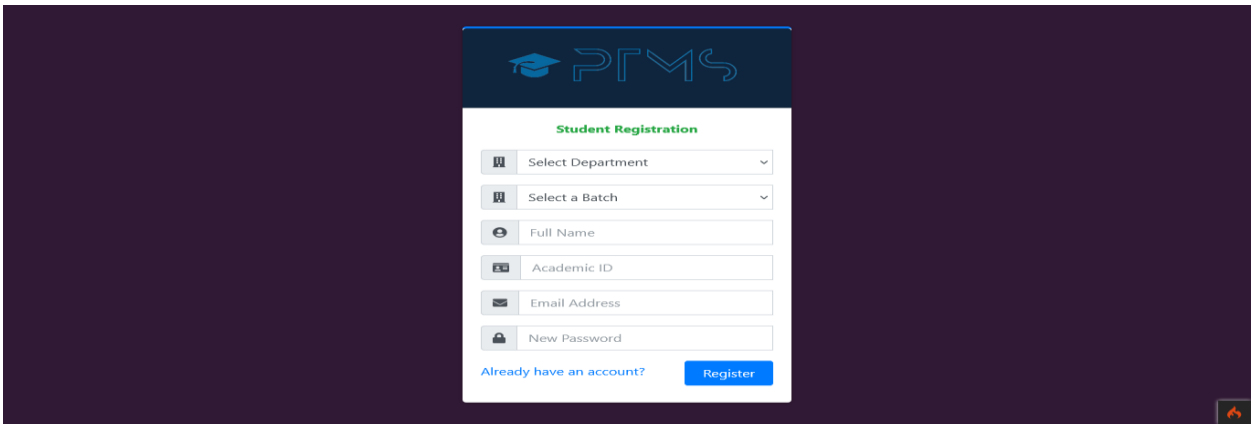

Figure 5.5 Student Registration Form

5.1.7 Supervisor Registration Form

The supervisor registration form is for verified supervisors of the institution. They will request the system admin by providing valid info through this web page.

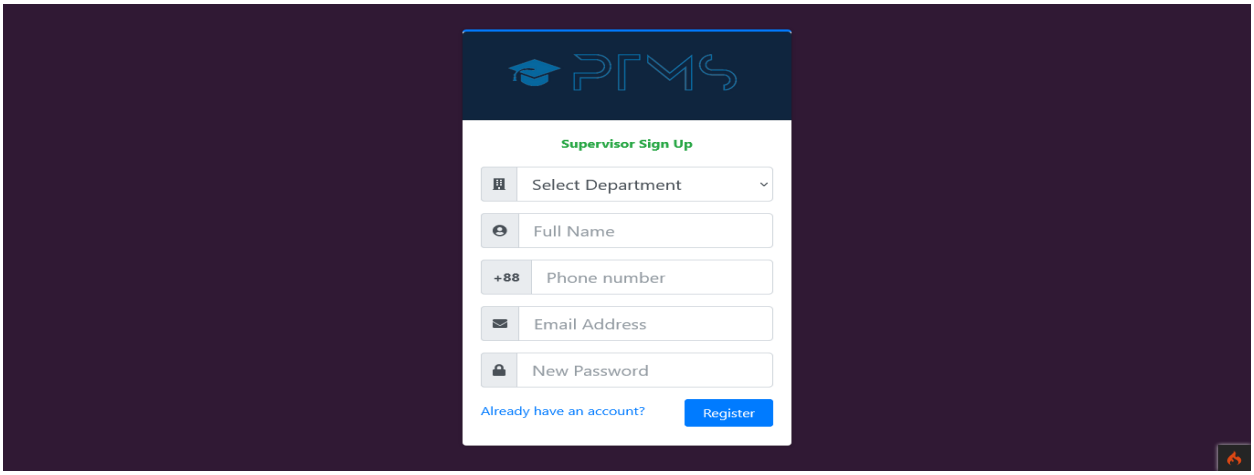

Figure 5.6 Supervisor Registration Form

5.2 Admin Panel

5.2.1 Dashboard

This panel has so many dynamic web pages. After a successful login admin will redirect to the dashboard. In the dashboard, there are 4 little blocks: total projects, supervisors, students, and running projects. When the supervisor registers in the system the requests of registration will appear in the admin panel. Only the admin can approve or decline supervisor registration requests via email notification.

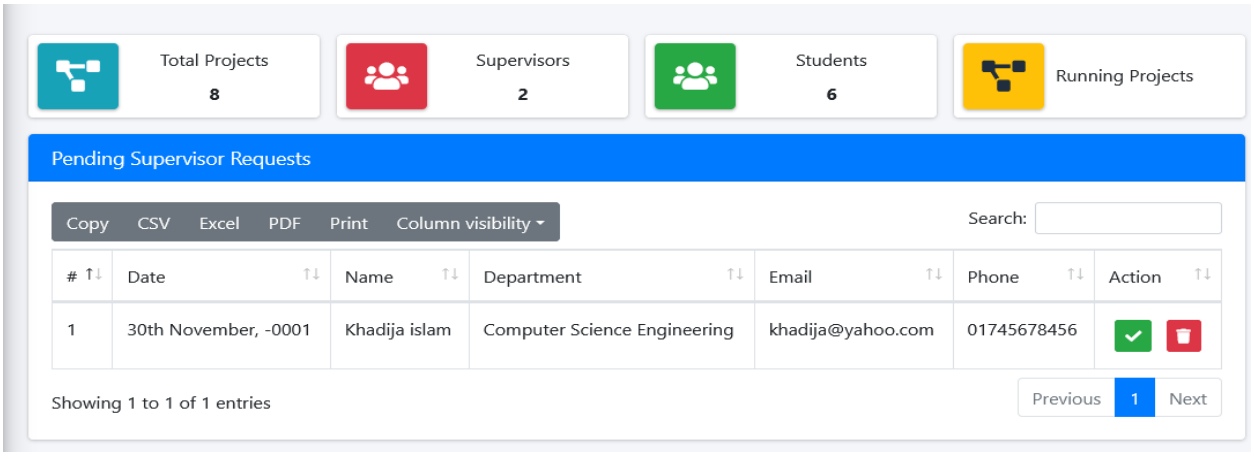

Figure 5.7 Dashboard Page

Requests sent by students can be kept pending in the same way. Admin can take action as accept or reject

5.2.2 Supervisor List

In the supervisor list section, we can see the list of active supervisors and their joining date, department, email, and phone number.

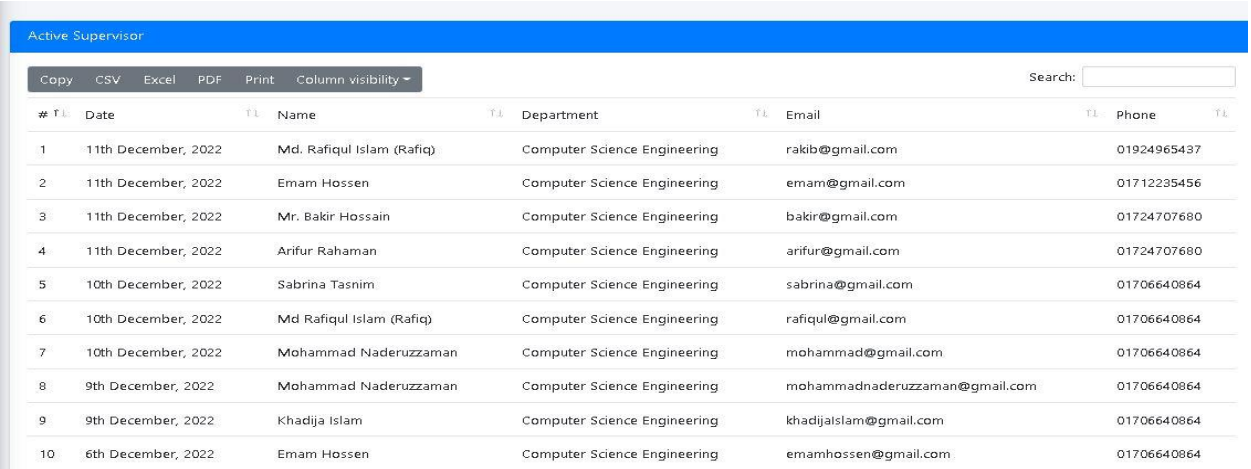

Figure 5.8 Supervisor List

5.2.3 Pending Supervisor List

This is the pending supervisor requests section, here admin can see the list of pending supervisors. Admin can take action as accept or reject and also can see the supervisor's pending time, department, email, and phone number.

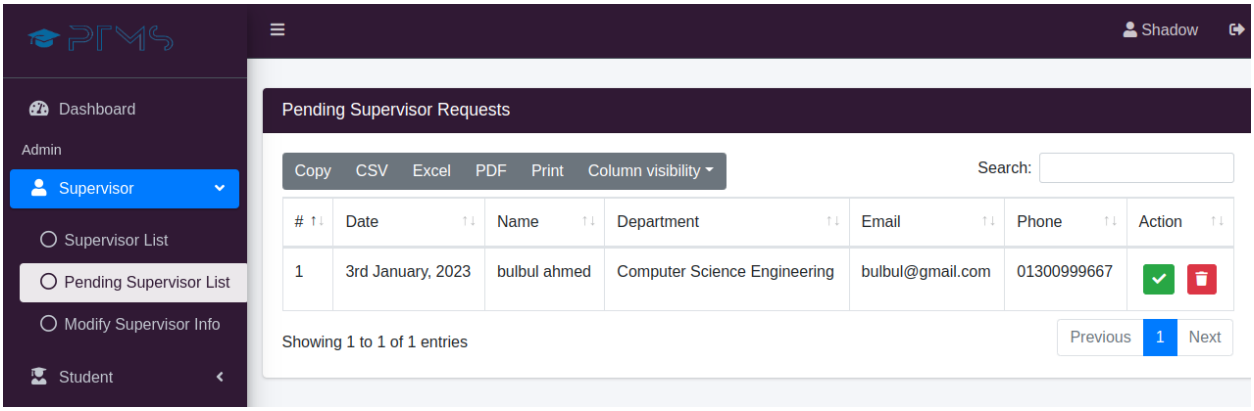

Figure 5.9 Pending Supervisor List

5.2.4 Modified Supervisors Info

The supervisor's required information (date, name, department, email, phone number) is modified through this section. As an action admin can edit supervisors' info (department, name, supervisor id, phone number, email, and address).

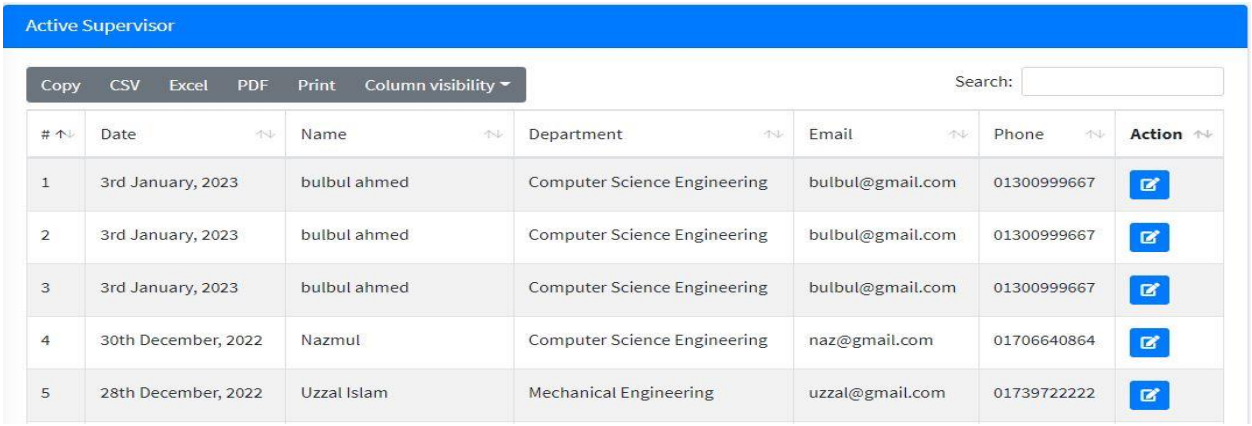

Figure 5.10 Editable Supervisor List

5.2.5 Active Students

In the student section, this is the active student's table where the admin can see the active students' information as we can see in the picture.

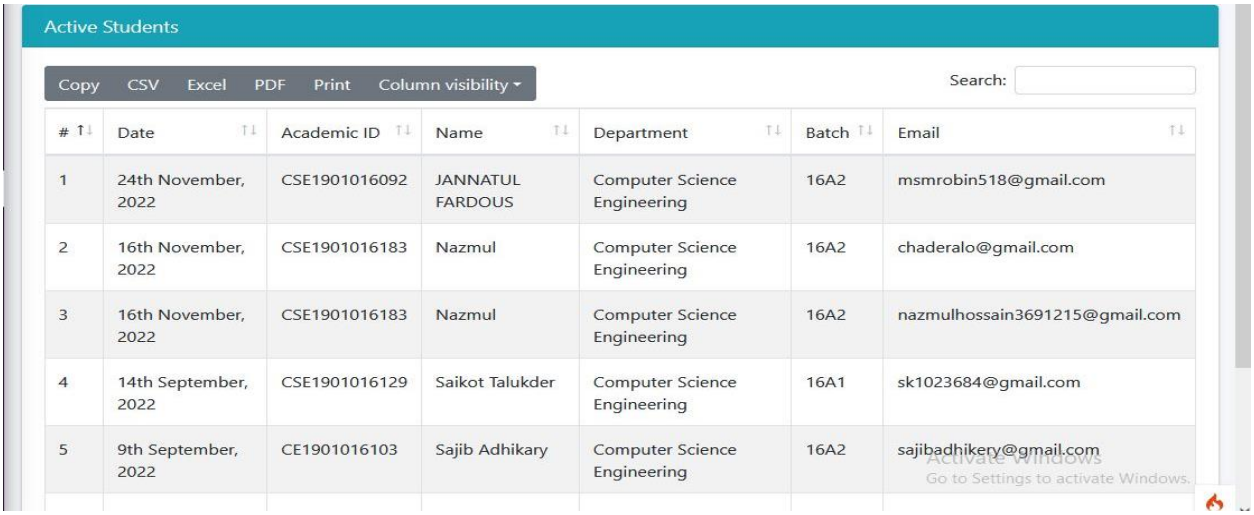

Figure 5.11 Active Students

5.2.6 Pending Student List

In this section “the pending student requests table”, the admin can keep pending the requested students. Here admin can see the date, academic id, name, department, batch, and email of pending students. Admin can take action as accept or reject.

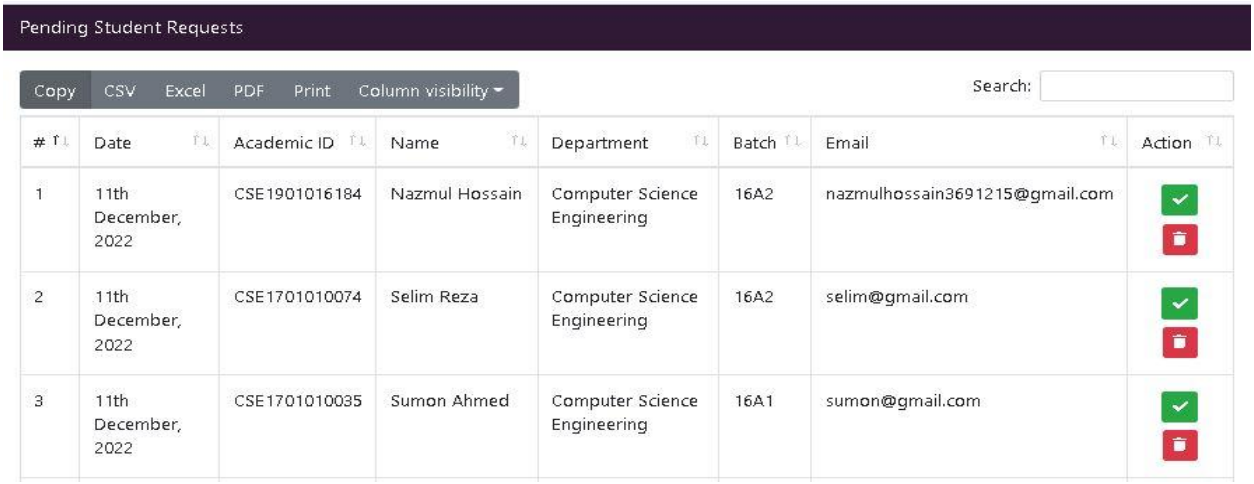

Figure 5.12 Pending Student List

5.2.7 New Group

A new group can be created through this section. From this section, the admin can see the project name and description. The group should have a supervisor and at least one student and a maximum of 5 students. The first student/member is the group leader.

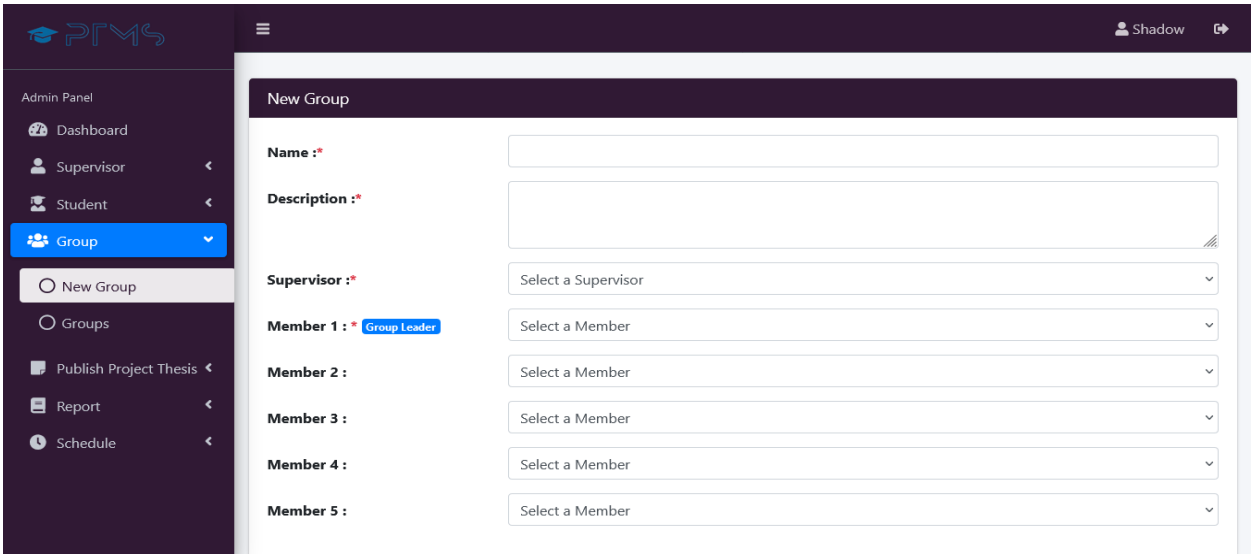

Figure 5.13 New groups

5.2.8 Groups

In this section, the admin can see the group name, description, department, and group supervisors. The admin can see the group details and group members and can also edit the group as an action.

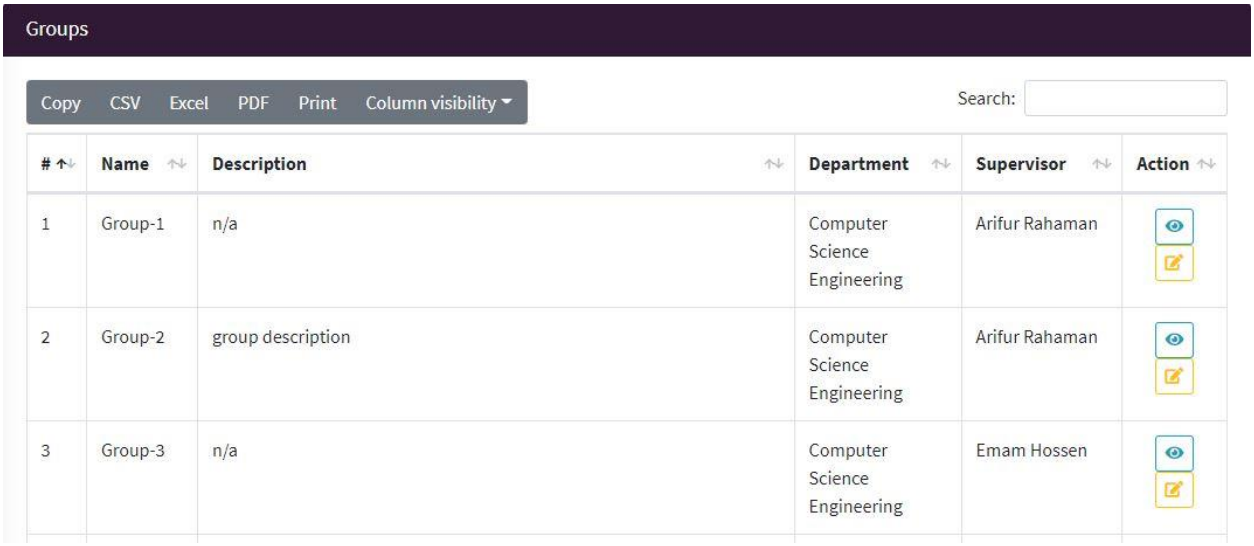

Figure 5.14 All Groups

5.2.9 Publish Approved

In the approved projects section, the admin can approve different group projects. Here admin can see the approved project's name, remarks, and approval time. Admin can view project banner and pdf and take action as publish or reject.

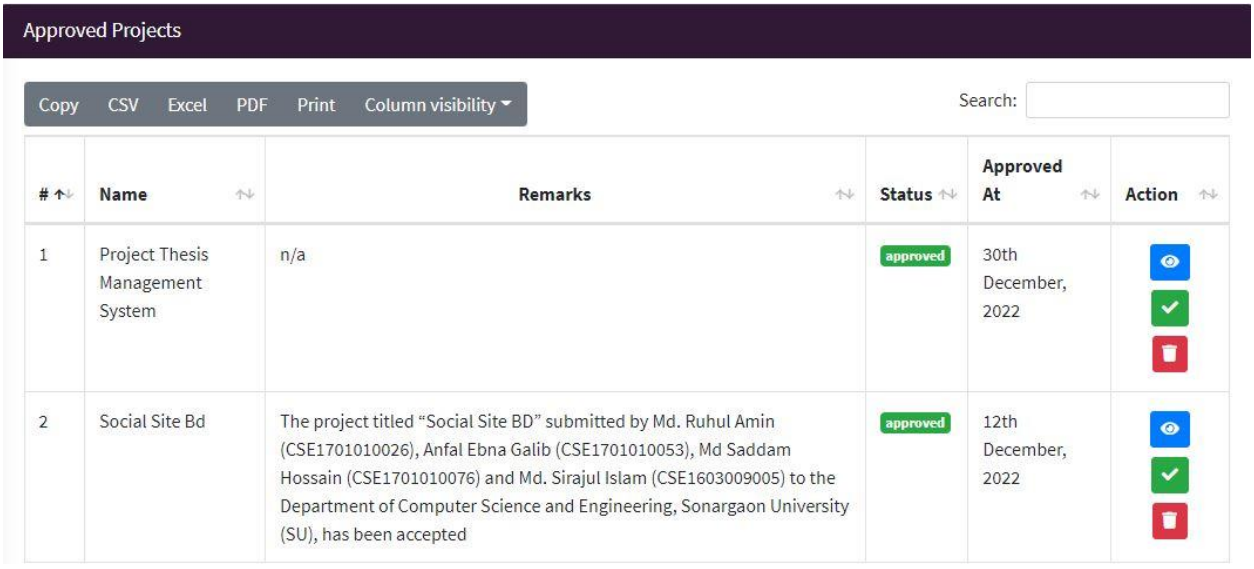

Figure 5.15 Publish Approved

5.2.10 Published Projects

The list of projects approved by the admin can be seen in this section and also the time for approving the projects will be mentioned here.

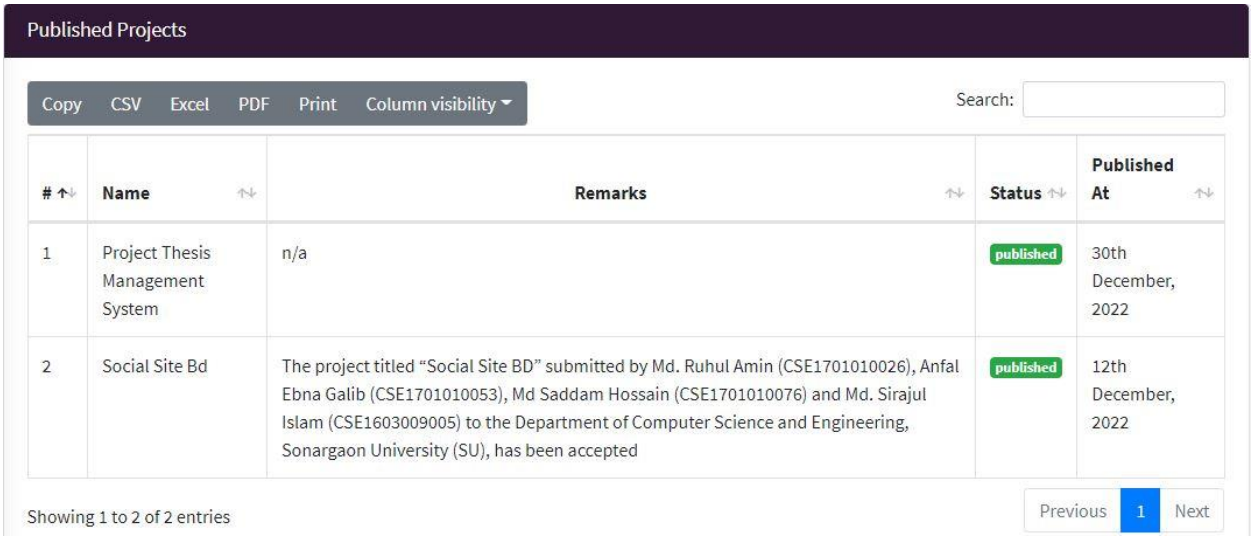

Figure 5.16 Published Projects

5.2.11 Assigned group

From this section admin will find the department and phone number of each supervisor and can see the group number assigned to the supervisor.

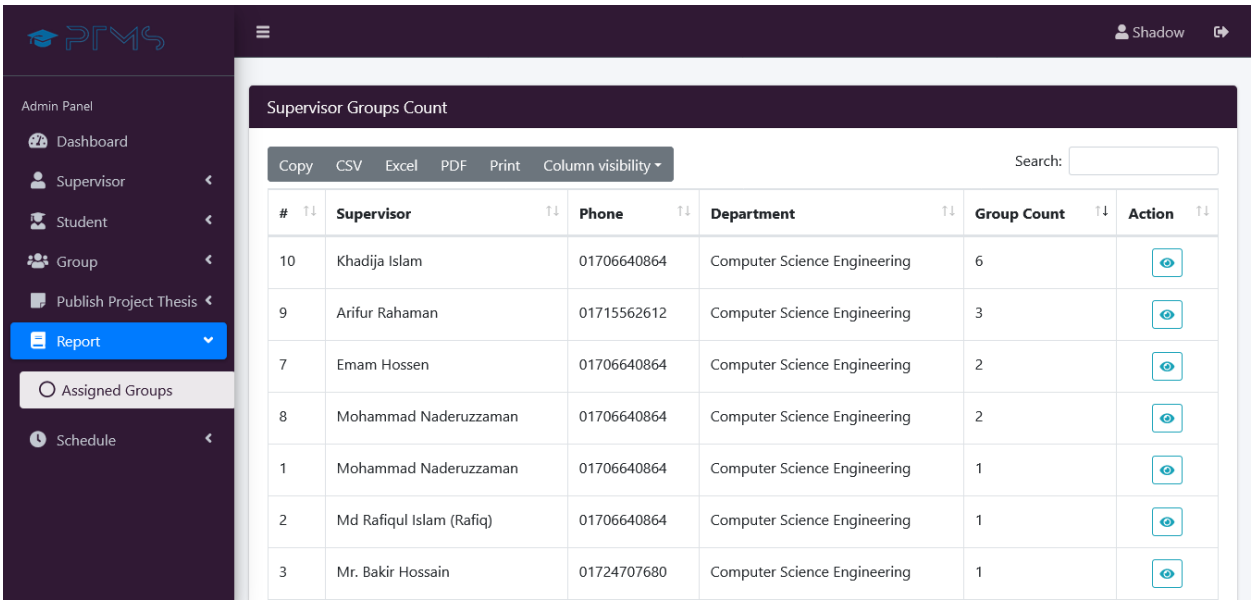

Figure 5.17 Assigned group

5.2.12 Add schedule

Here, the schedule will be added by the admin. By this section, the admin can send any notice and the user will get the notification through email. Here admin can add the start date, start time, and description of the notice.

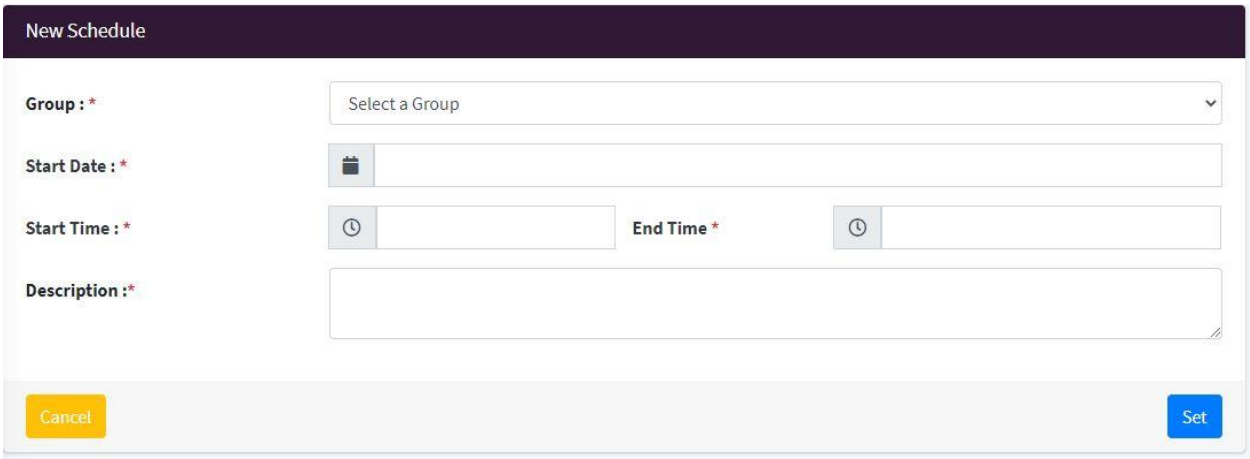

Figure 5.18 Add schedule

5.2.13 Check schedule

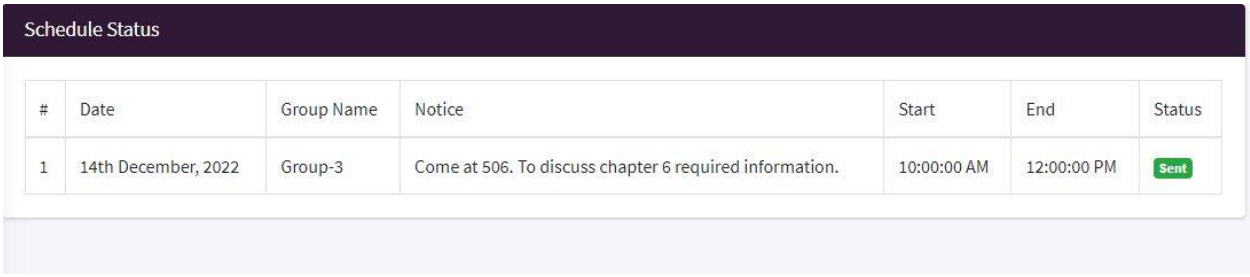

Figure 5.19 Check schedule

5.3 Supervisor Panel

5.3.1 Dashboard

This panel has so many dynamic web pages. After a successful login supervisor will redirect to the dashboard. In the dashboard there are 2 little blocks, they are total projects and assigned groups. when the student will send the requests and the supervisor can pending the supervisor's requests.

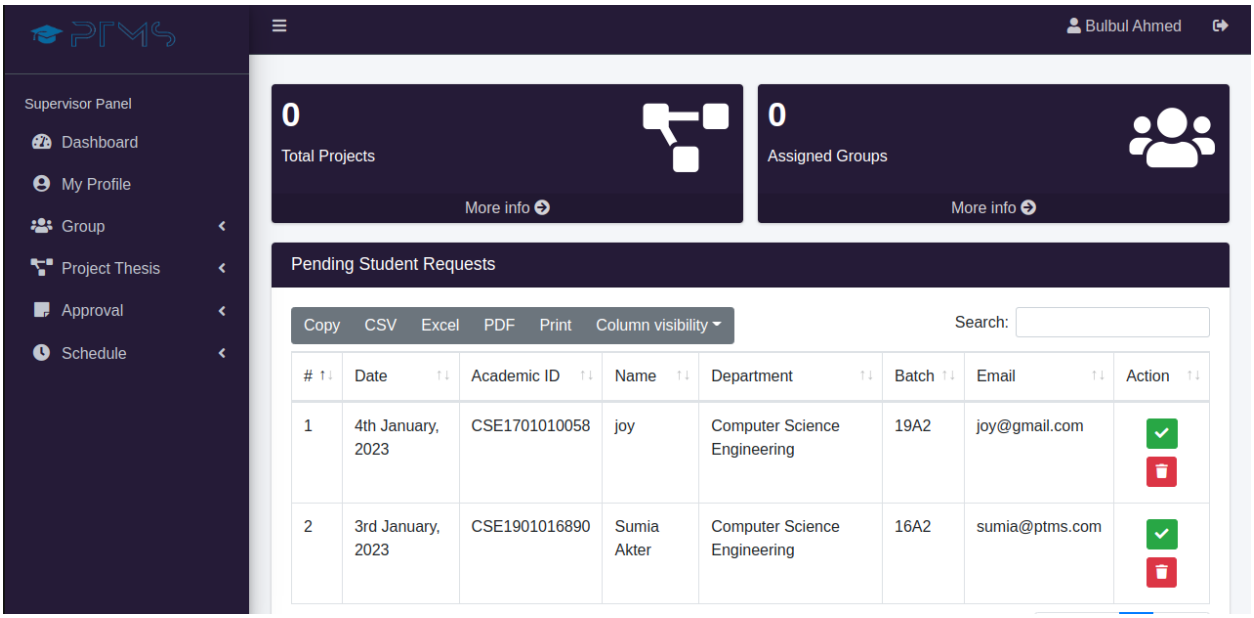

Figure 5.20 Dashboard

5.3.2 Supervisor Profile

This is the supervisor profile section. Here he can see his name, department, and phone number.

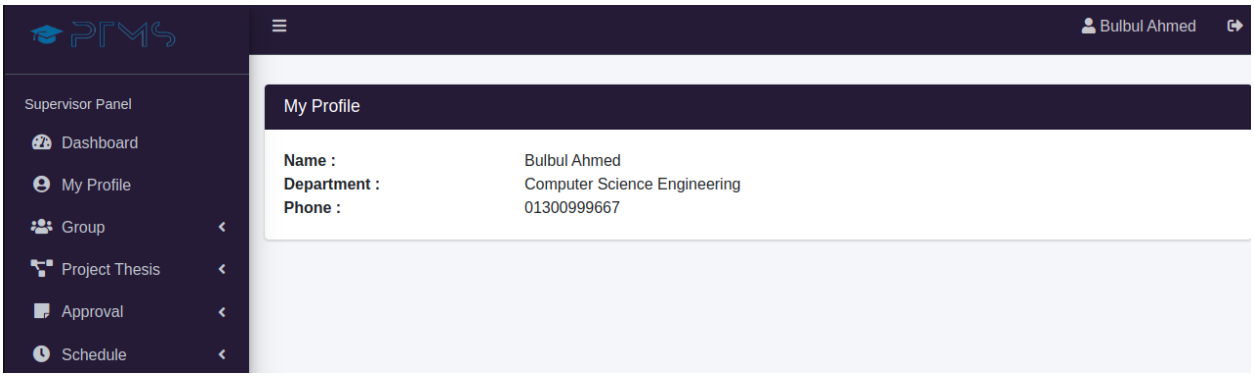

Figure 5.21 Supervisor Profile

5.3.3 Assigned Group

In the group section, the supervisor can go to the group option and see how many groups are there under him and what is the name of the group. The supervisor can see the group details and group members and can also edit the group as an action.

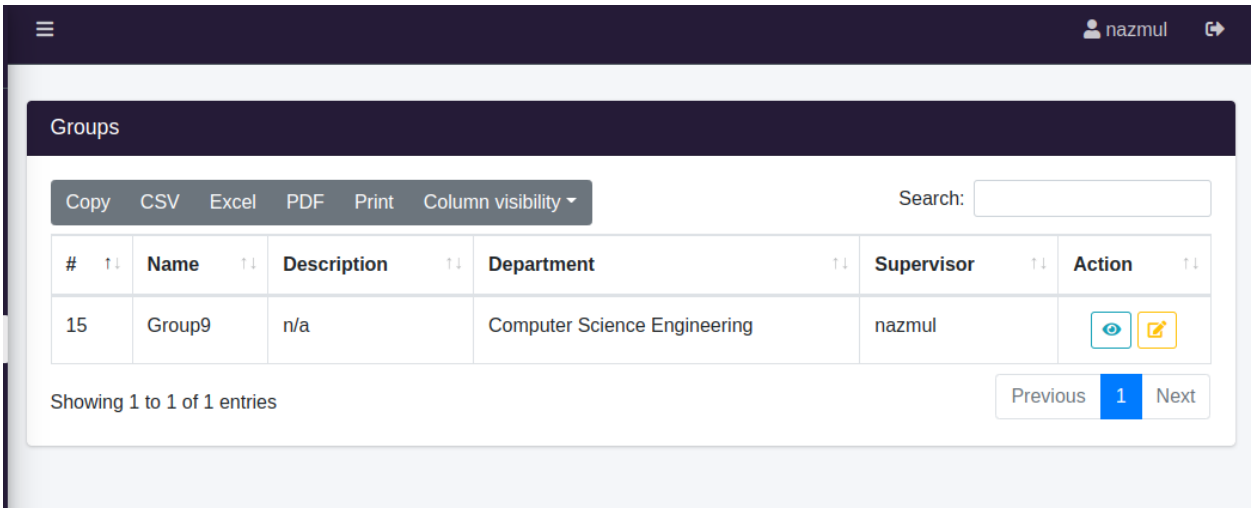

Figure 5.22 Assigned Group

5.3.4 New project

In the new project section, supervisors can create new groups from the section and assign them by group name, type, project name, and description.

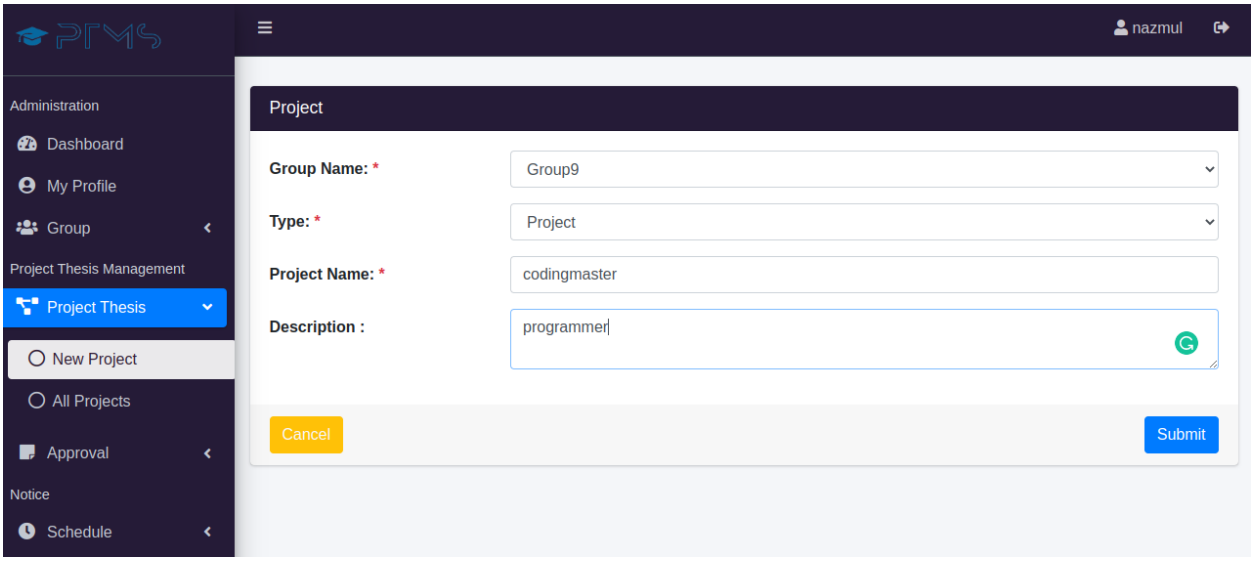

Figure 5.23 New project

5.3.5 All Project

Supervisors can see how many projects are under them through this section and all group details can be seen through this section.

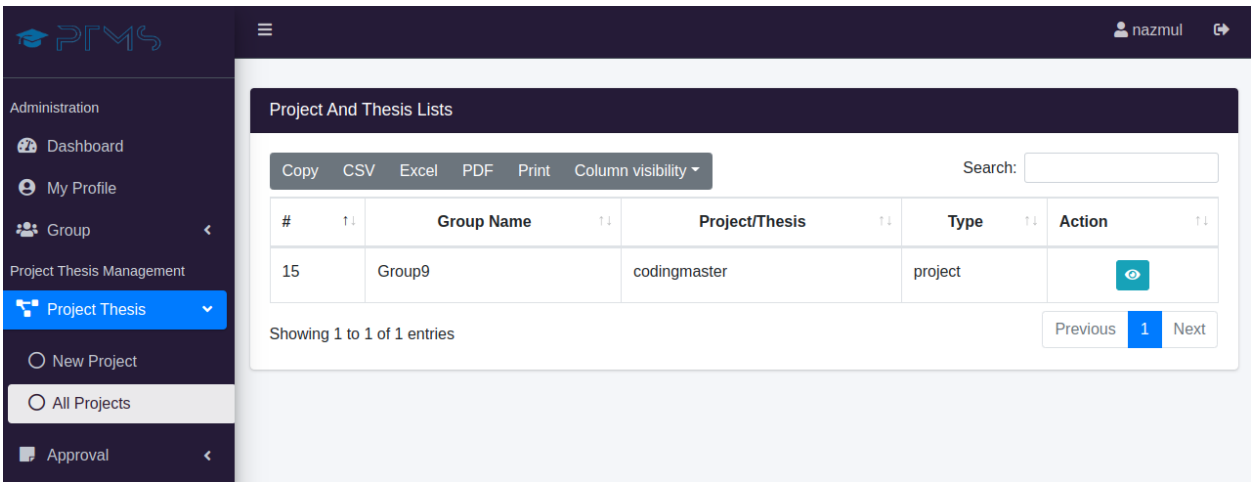

Figure 5.24 All Project

5.3.6 Approve Project-Thesis

Through the approval section, the supervisor can see how many projects have been approved under him.

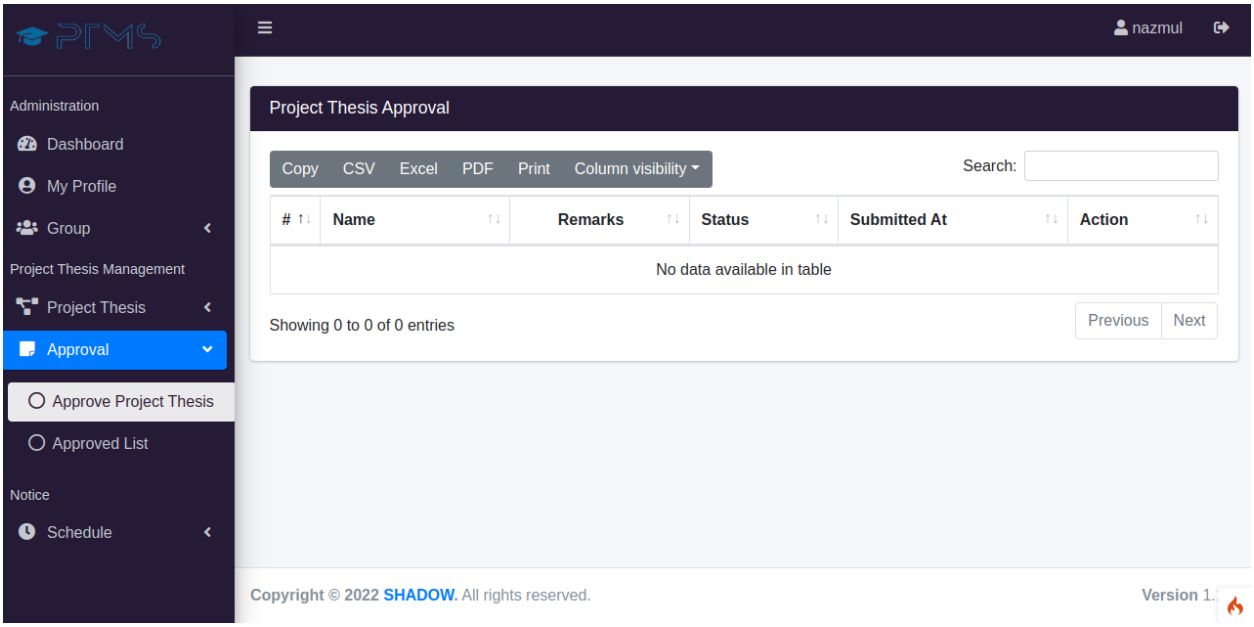

Figure 5.25 Approve Project-Thesis

5.3.7 Approve List

The supervisor can approve the project through. If the supervisor approves, the project will be approved.

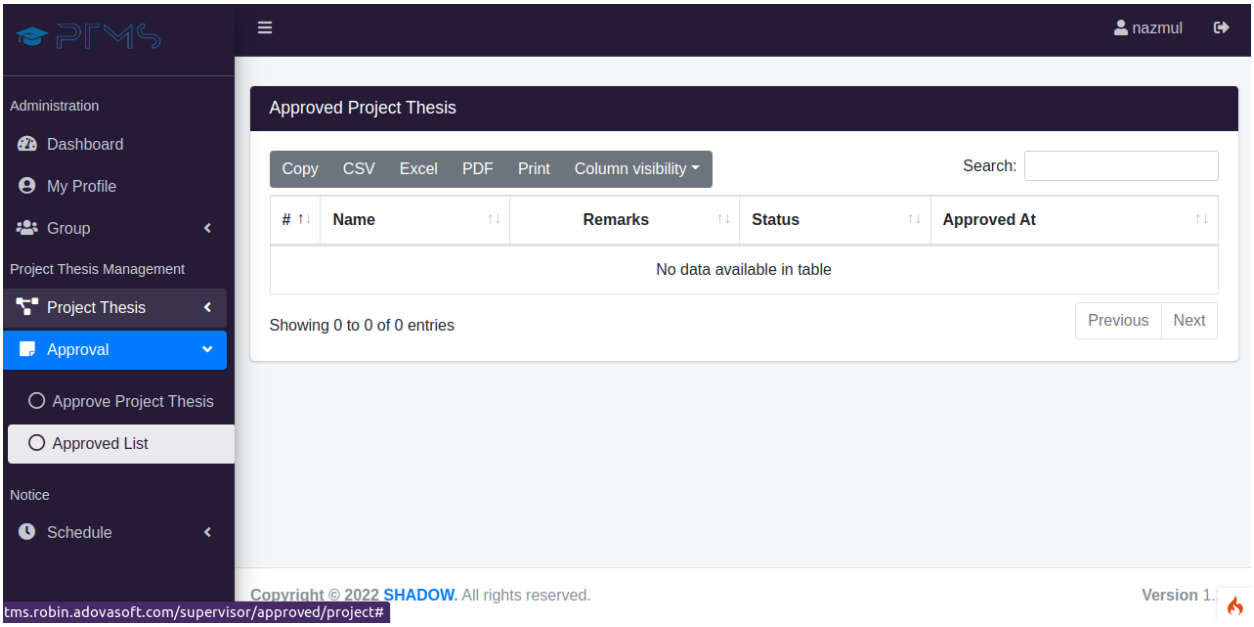

Figure 5.26 Approve List

5.3.8 Add schedule

The supervisor can create the schedule through it and send it to the group. By this section the supervisor can send any notice and the students will get the notification. Here the supervisor can add the start date, start time, and description of the notice.

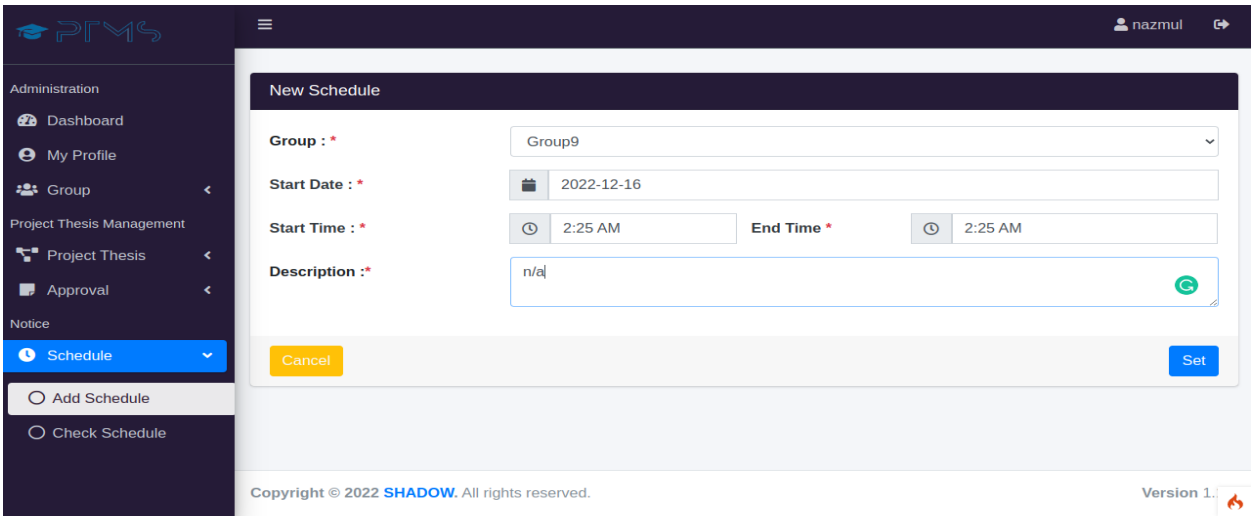

Figure 5.27 Add schedule

5.3.9 Check Schedule

The supervisor prepares the schedule and sends it to the group members and the group members meet with the supervisor.

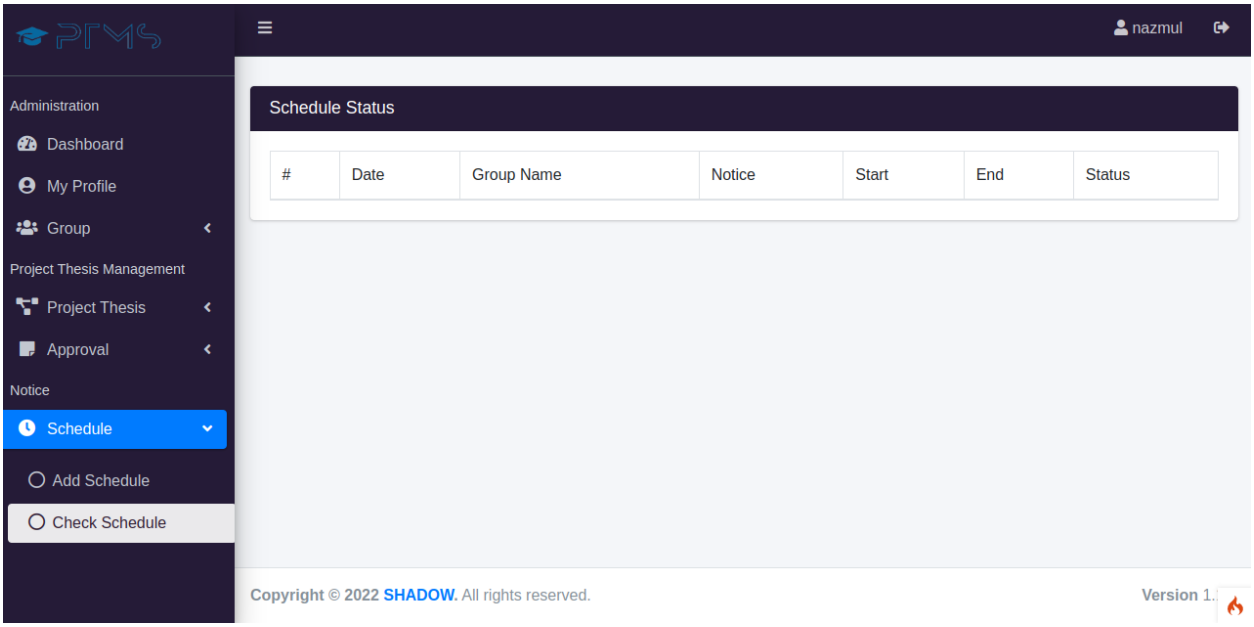

Figure 5.28 Check Schedule

5.4 Student Panel

5.4.1 Dashboard

This panel has so many dynamic web pages. After a successful login student will redirect to the dashboard. In the dashboard, there are 3 cards they are total projects, students, and running projects.

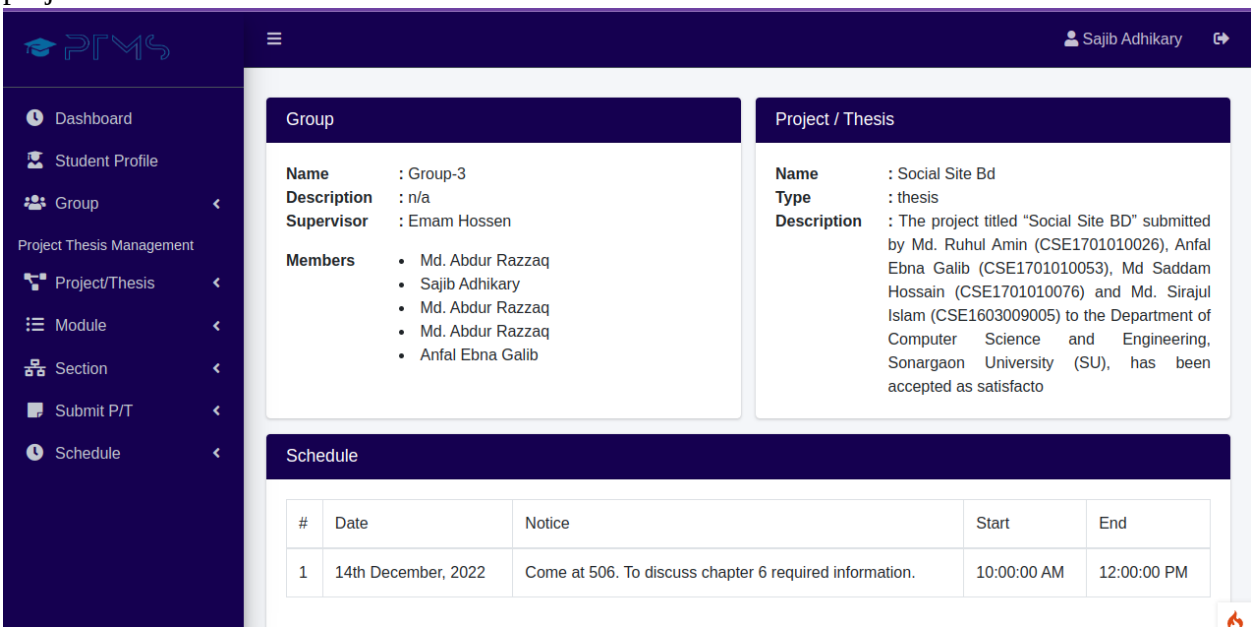

Figure 5.29 Dashboard

5.4.2 Student Profile

Student profile section a student can go to his profile and see his name department section and academic id.

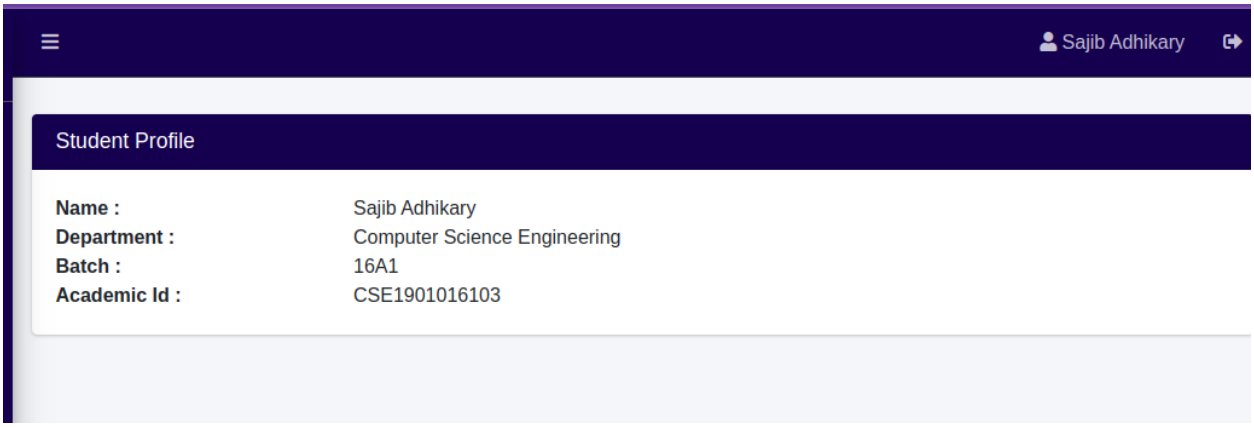

Figure 5.30 Student Profile

5.4.3 Group Details

Student profile section, a student can go to his profile and see his name, department section, and academic id. In the dashboard, there are 2 cards that are total projects.

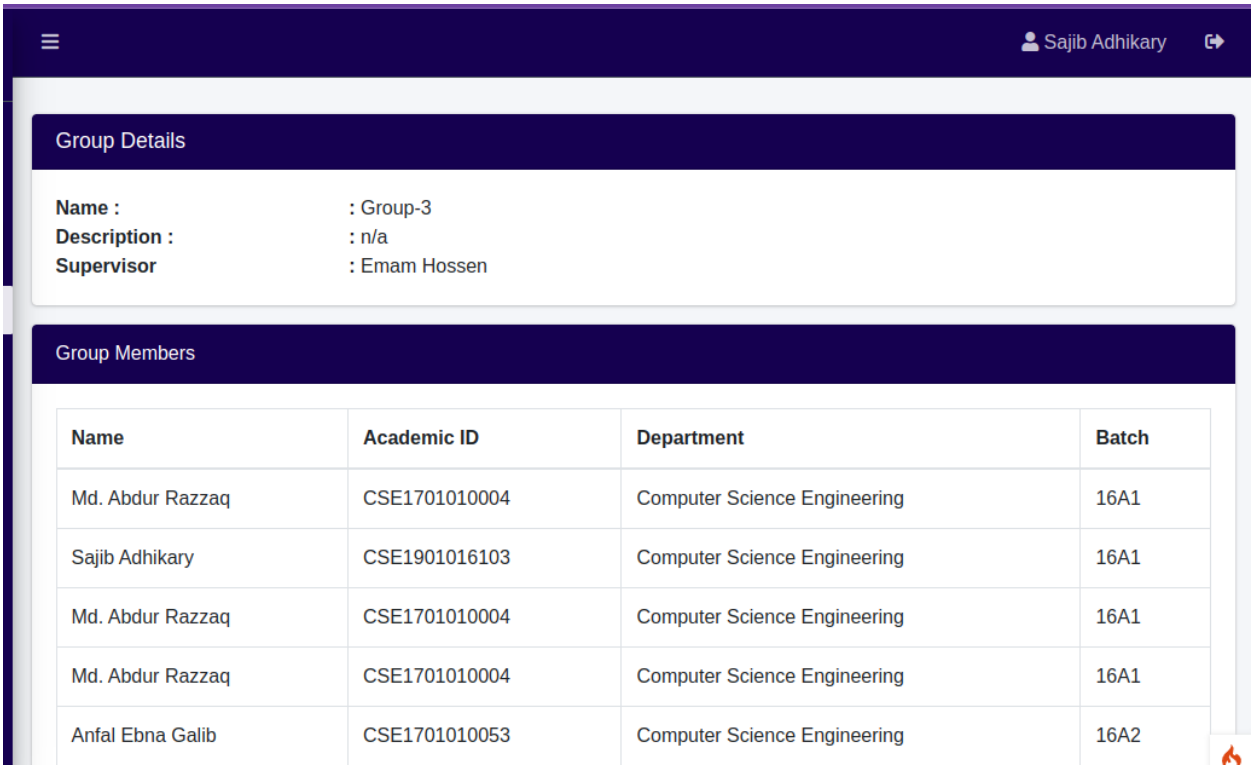

Figure 5.31 Group Details

5.4.4 Request for supervisor

Student request for supervisor section, students can make supervisors from the supervisor panel and send requests, and if the supervisor accepts them, the project can be completed easily.

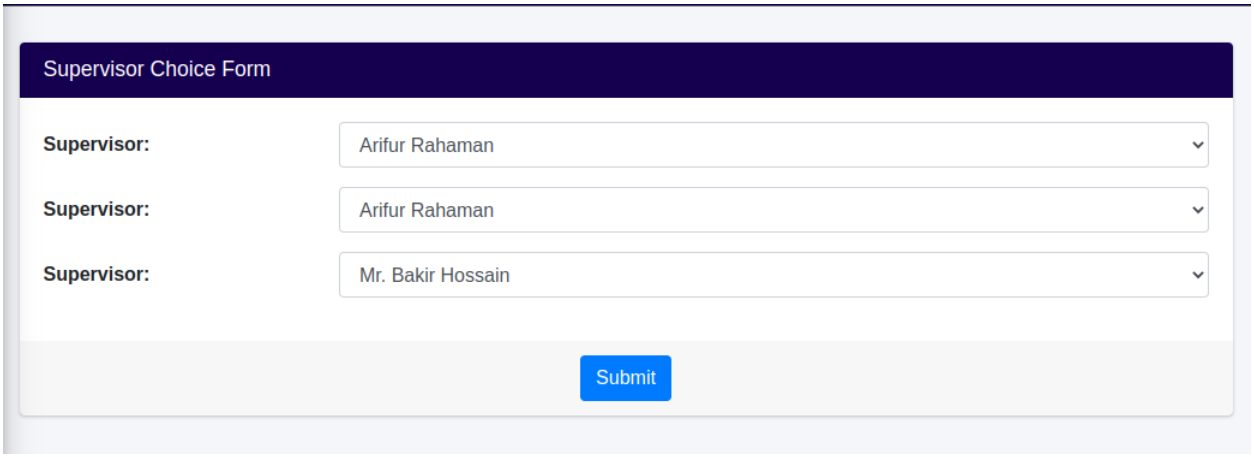

Figure 5.32 Request for supervisor

5.4.5 Project Details

In the Student project info section, students will know projector information like group name and group description information. How many members are in this group can also be seen through infection, Clicking on the details button will show the percentage of work completed.

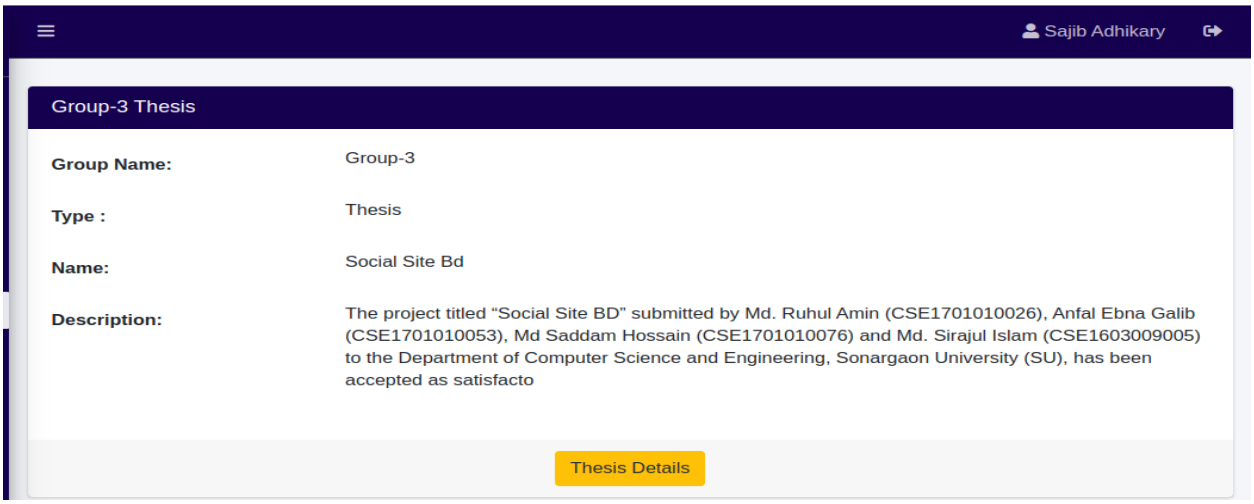

Figure 5.33 Project Details

5.4.6 Module

Student module section, module creation is only for the group leader. If a group leader login into his panel only he can create a project module. other students are not allowed to create project modules.

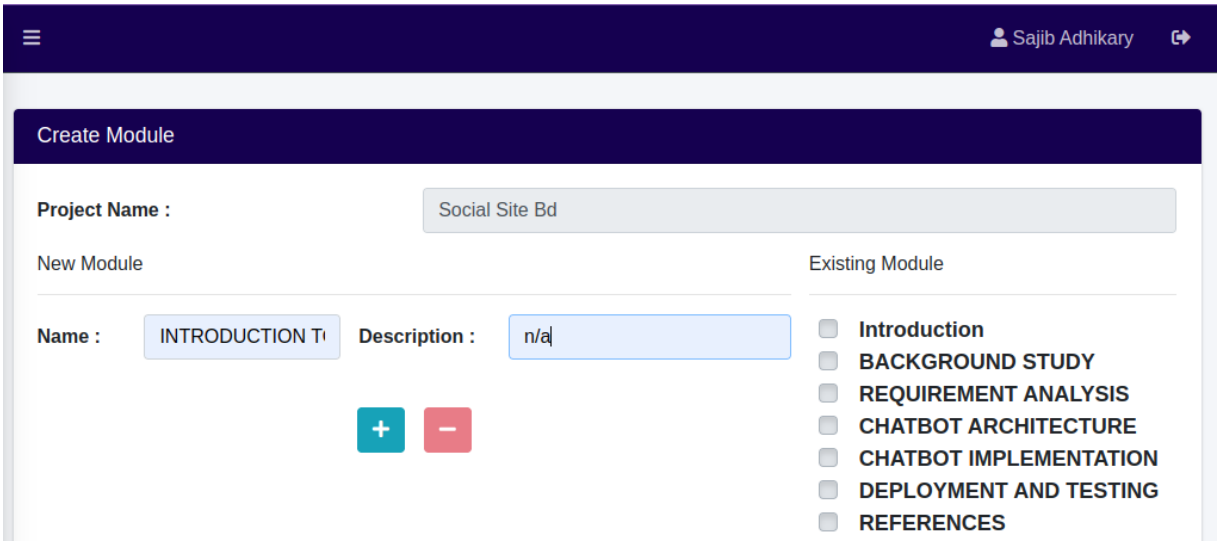

Figure 5.34 module

5.4.7 New Section

Student New section, through this section, students can select their project team, select the CHAPTER of the project and get the description of the project

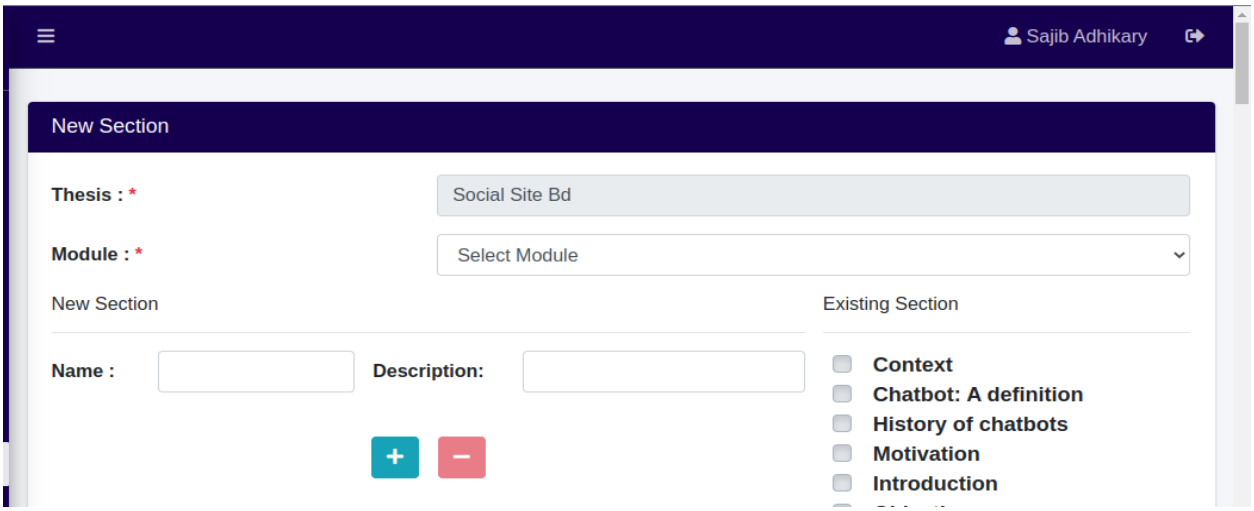

Figure 5.35 Section

5.4.8 Assign section

Only the group leader and supervisor can assign their group members a specific section to a specific student.

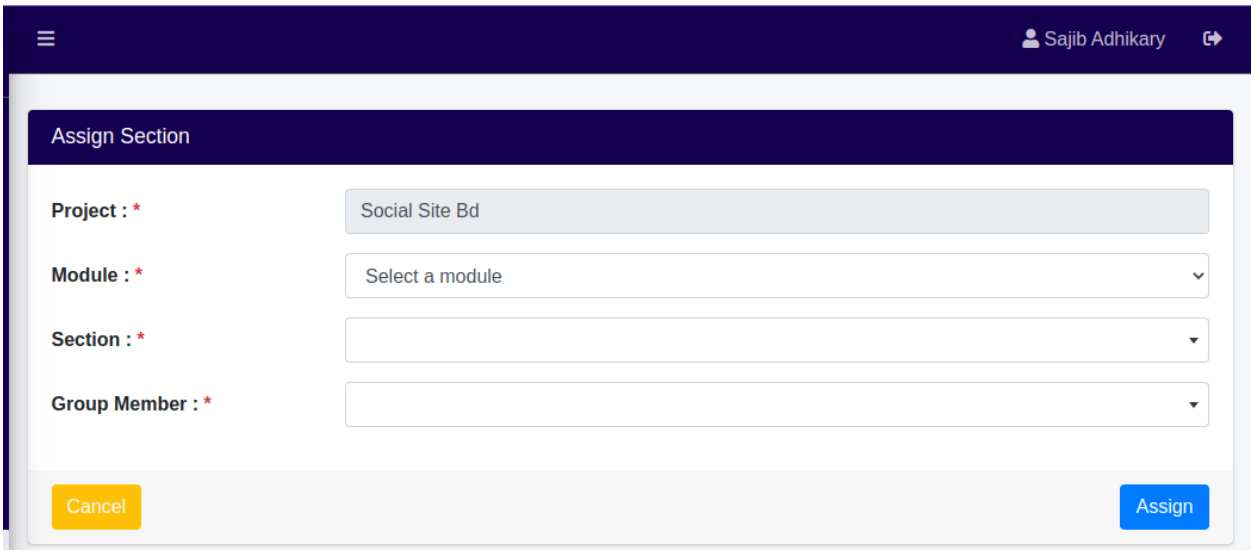

Figure 5.36 Assign Section

5.4.9 Status section

Students can check how much work has been completed through this section and how much work is left.

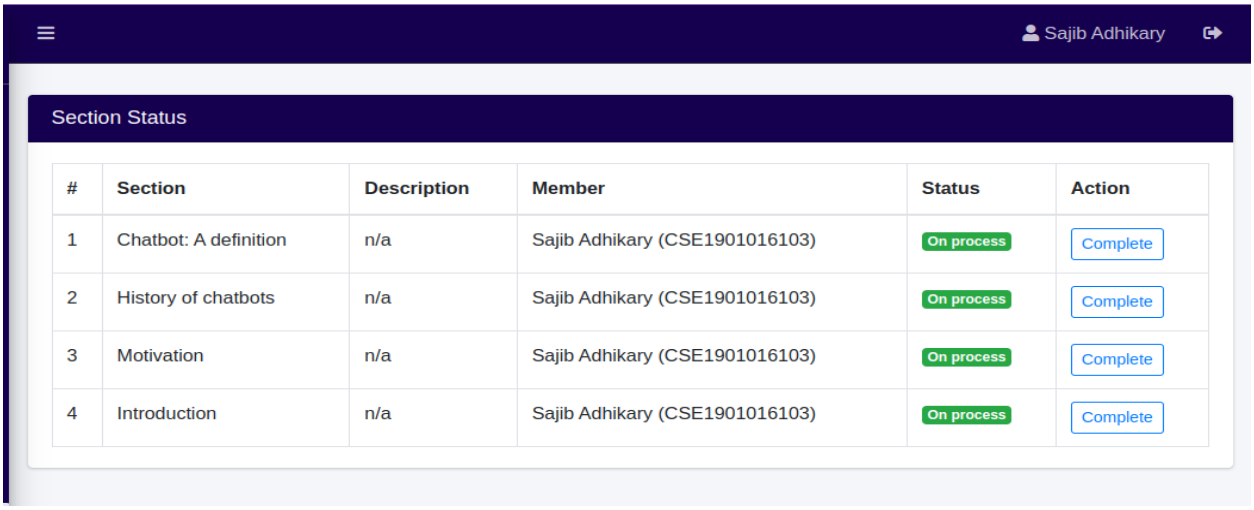

Figure 5.37 Status Section

5.4.10 Submit New

Students can submit Project thesis a new through this section.

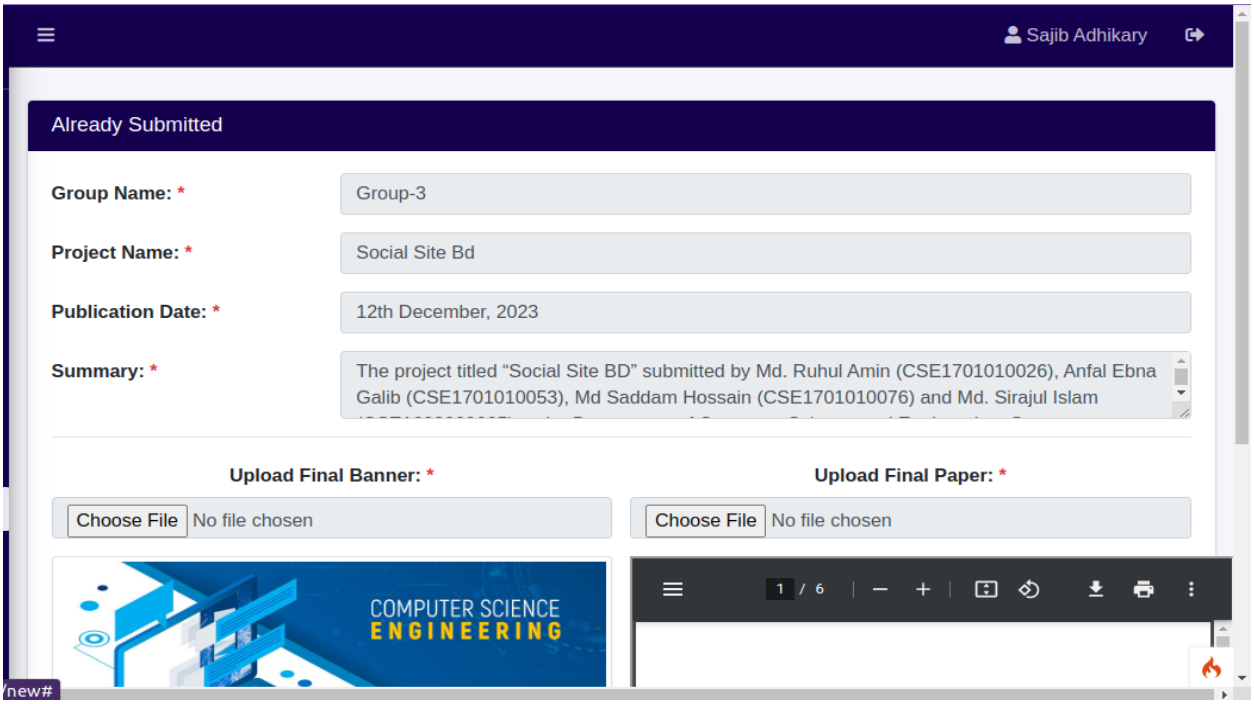

Figure 5.38 Submit Section

5.4.11 Check Schedule

Through the schedule section students can check their schedule.

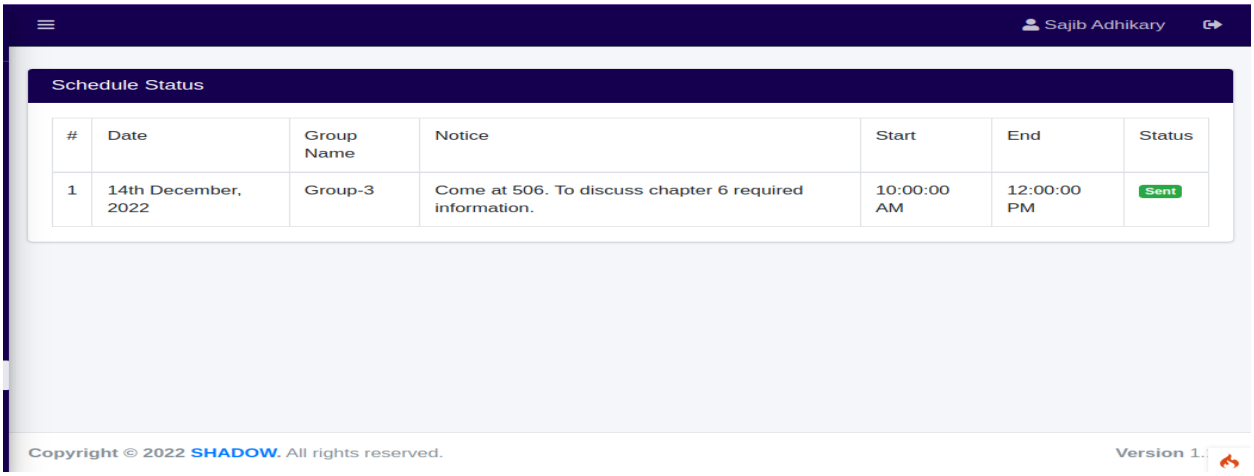

Figure 5.39 check Schedule

CHAPTER 6

CONCLUSION AND FUTURE IMPLEMENTS

This chapter discusses what has been done, recommendations on the system's operations, the future scope of this system, and the conclusions that are to be made regarding the system's functioning in the current status and that of the future where some improvements are to be made on the system.

6.1 Recommendation

1. We recommend that the system be used by other institutions like colleges, Universities, and other institutions that manage research or project-related works in teams. Because we believe that the system can effectively and efficiently do tasks of project and thesis publishing related works.

2. We recommend that more research should be done that how to use the system in an attractive way

3. More research should also be done to extend this system to include the whole project thesis work-related departments of an individual institution.

4. We recommend that by making the web application more responsive the user of this system will be able to do their work easily on their android smartphone.

6.2 Limitation and Future Works

1. Live communication within Admin, Supervisor, and Students.
2. Year-wise published project thesis reports.
3. Department-wise published project thesis reports.
4. Student verification with their ID card scan copy.
5. Notice for students and supervisors from all departments or specific departments.

6.3 Conclusion

The management system will benefit every research-based institution like college, university, and other institutions that manage research or project-related works in teams.

A huge number of projects and theses have been done every year in universities and research-based institutions. The system will play an important role in that kind of institution in capability integration and leadership capacity development. As a consequence, the area of research and project management is becoming increasingly important for universities and research-based institutions.

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