**Minor Project Report II**
**on**

# "Blood Bank Management System"


**FAR-WESTERN UNIVERSITY**
**FACULTY OF SCIENCE AND TECHNOLOGY**
**(Central Department of CSIT)**

**Mahendranagr, Kanchanpur**


***In a partial fulfillment of requirement for the Bachelor's Degree in Computer Science and Information Technology***

**Submitted To:**

**Central Department of Computer Science and Information Technology**
**Far-Western University**
**Central Campus**

**Submitted By:**


**Bhumika Pandey …….....(8170106)**
**Hema Kumari Pandey ……...(8170112)**
**Khadak Bist ……(8170116)**
**Premkala Budha …….(8170124)**
**Sancheet Pant ……..(8170127)**


**April 2025**

## DECLARATION

We hereby declare that the minor project report titled **"Blood Bank Management System"** is submitted for the partial fulfillment of the requirements of the **BSc.CSIT Seventh semester minor project II** at **Far-Western University**. We affirm that this project is the result of our original work and effort.

We have collaboratively contributed to the development and implementation of the **Blood Bank Management System** project. Each team member has played a vital role in its conceptualization, design, coding, testing, and documentation.

This project is a culmination of our collective efforts, dedication, and commitment to developing an efficient, secure, and user-friendly platform for blood donation and management.

### Team Members:

**Bhumika Pandey ..... (8170106)**

**Hema Kumari Pandey ..... (8170112)**

**Khadak Bist ..... (8170116)**

**Premkala Budha …(8170124)**

**Sancheet Pant ..... (8170127)**

**Date:** April 27, 2025

## LETTER OF SUPERVISION

**To Whom It May Concern,**

This is to certify that the project entitled "**Blood Bank Management System**" has been prepared by **Bhumika Pandey, Hema Pandey, Khadak Bist, PremKala Budha, and Sancheet Pant** in partial fulfillment of the requirements for the degree of BSc. CSIT under my guidance and supervision.

The project demonstrates the students' understanding of software development, database management, and system design while addressing real-world challenges in blood donation tracking, donor management, and inventory control for blood banks. I confirm that the work is original and has been carried out in accordance with the academic standards of Far Western University

I recommend this project for final approval and evaluation.

**Sincerely**

**Shiv Shankar Pant**
**Supervisor**
**Assistant Professor**
**BSc. CSIT**
**Date 2082-01-12**

## LETTER OF APPROVAL

This is to certify that the project report entitled:

**"BLOOD BANK MANAGEMENT SYSTEM"**

prepared by:

Ms. Bhumika Pandey

Ms. Hema Kumari Pandey

Mr. Khadak Bist

Ms. Premkala Budha

Mr. Sancheet Pant

of **BSc. CSIT (Seventh Semester)**, in partial fulfillment of the requirements for the degree of **Bachelor of Science in Computer Science and Information Technology (BSc. CSIT)**, has been thoroughly examined.

After careful evaluation, we confirm that:

1. The project satisfies the academic standards of Far Western University.
2. The scope and quality meet the expected criteria for the degree requirement.
3. The work is original and has been completed under proper supervision.

**Recommendation:**
This project is hereby approved for final acceptance and evaluation.

…….

**Supevisor**

**Shiv Shankar Pant**
Assistant Professor
Central Department of CSIT

…….

**Head of Department:**

**Karn Dev Bhatt**
Central Department of CSIT
Far Western University

…….

**Internal Examiner**

…….

**External Examiner**

## ACKNOWLEDGEMENT

We would like to express our deepest gratitude to all those who contributed to the successful completion of our **Blood Bank Management System** project.

First and foremost, we are profoundly grateful to our project supervisor, **Mr. Shiv Shankar Pant (Assistant Professor, Department of CSIT, Far Western University)**, for his unwavering guidance, patience, and invaluable expertise. His insightful feedback and constant encouragement kept us motivated throughout this journey.

We extend our sincere appreciation to **Mr. Karn Dev Bhatt (Head of Department, CSIT, Far Western University)** and all faculty members of the **Central Department of CSIT** for providing us with the necessary resources, knowledge, and academic support. Their teachings laid the foundation for this project.

To our incredible team members—**Ms. Bhumika Pandey, Ms. Hema Pandey, Mr. Khadak Bist, Ms. Premkala Budha, and Mr. Sancheet Pant**—thank you for your dedication, collaboration, and hard work. Every late-night coding session, brainstorming meeting and problem-solving effort made this project possible..

This achievement would not have been possible without each of you. Thank you for being part of our journey.

Sincerely,

Ms. Bhumika Pandey
Ms. Hema Kumari Pandey
Mr. Khadak Bist
Ms. Premkala Budha
Mr. Sancheet Pant

**BSc. CSIT, Seventh Semester**
**Central Department of Science and Technology**
**Far Western University**
**Date: ……..**

# ABSTRACT

The Blood Bank Management System is a comprehensive web-based solution designed to streamline blood inventory management and donation processes for healthcare institutions. Developed in response to critical challenges in blood bank operations, this system provides efficient tracking and management of blood stocks using modern web technologies: HTML5, CSS3, JavaScript (Frontend), PHP (Backend), and MySQL (Database).

**Key Features Include:**

- **Real-time blood stock tracking** with automatic updates on blood group availability
- **Donation management** for recording donor details and blood collection
- **Request handling system** for hospitals and patients needing blood transfusions
- **Low stock alerts** to prevent shortages of critical blood groups
- **Secure multi-level login system** (Admin, Staff, Donors) with role-based access
- **Dashboard analytics** displaying blood inventory status and donation trends

This system ensures efficient blood distribution, reduces wastage, and enhances emergency response capabilities for blood banks.

## TABLE OF CONTENTS

**Content** **Page. No**

# List of Table



## LIST OF FIGURES

# ABBREVIATION

| | |
|---|---|
| CSIT | Computer Science and Information Technology |
| CSS | Cascading Style Sheet |
| DFD | Data Flow Diagram |
| FU | Far Western University |
| GB | Gigabytes |
| HTML | Hyper Text Markup Language |
| IT | Information Technology |
| JS | JavaScript |
| MySQL | My Structured Query Language |
| TC | Test Case |
| XAMPP | Cross-Platform, Apache, MySQL, PHP and Perl |
| WWW | World Wide Web |

# CHAPTER 1: INTRODUCTION

## 1.1 Literature Review

The Blood Bank Management System (BBMS) is particularly crucial in Nepal, where healthcare infrastructure faces unique challenges in blood supply management. Studies on Nepal's blood banking system reveal critical gaps:

### 1. Manual Systems in Far-Western Hospitals

- **Paper-Based Records**: Hospitals in Mahendranagar and Dhangadhi primarily use paper-based records for blood inventory, leading to:
    - 15–20% recording errors in blood group matching (Health Ministry Report, 2023).
    - Expired blood wastage due to lack of automated expiry alerts (Kailali Blood Bank Audit, 2022).

### 2. Emergency Response Delays

- **Cross-Border Transfers**: Cross-border blood transfers (India-Nepal) during shortages take over 3 hours due to uncoordinated systems
- **Lack of Real-Time Visibility**: No real-time visibility of blood stocks across Far-Western hospitals delays response in accident and maternity cases.

### 3. Donor Management Challenges

- **Seasonal Shortages**: Seasonal shortages occur when migrant workers (major donors) leave (Nepal Red Cross Society Data).
- **Low Repeat Donor Rate**: Less than 10% repeat donors in the region due to absence of reminder systems

### Existing Solutions in Nepal

- **Web-Based BBMS**: Implementation at Kathmandu hospitals reduced wastage by 30% (Teaching Hospital Case Study, 2021).
- **SMS-Based Donor Alerts**: SMS-based donor alerts in Pokhara improved donor turnout by 25% (Gandaki Health Directorate).

### Research Gaps in Nepal

- **Lack of Integrated Systems**: No integrated system exists for Far-Western hospitals.
- **Digital Literacy**: Low digital literacy among staff necessitates simpler interfaces

### 1.2 Problem Statement

This project aims to address the critical challenges faced by blood banks in Nepal, especially in the Far-Western region, by developing a **digital Blood Bank Management System (BBMS)** with the following objectives:

- ✔ **Real-time blood stock monitoring** to provide instant updates on available blood units across hospitals.
- ✔ **Faster donor-recipient matching** to speed up emergency responses, such as during accidents or maternity cases.
- ✔ **Reduced administrative workload** by eliminating paper-based records and automating routine tasks.
- ✔ **Effective blood inventory management** to minimize wastage, avoid shortages, and ensure optimal use of blood resources.
- ✔ **Easy blood search during emergencies**, enabling quick identification and allocation of required blood types.

Ultimately, the system will modernize blood bank operations, reduce human errors, and save lives through faster and more efficient blood management.

### 1.3 Objectives

The primary objectives of this project are:

1. **To develop a user-friendly web platform** for blood banks to manage donations, requests, and inventory.
2. **To automate critical processes**:
    - Blood stock level alerts (low/expired)
3. **To improve accessibility**:
    - Secure login for admins, hospital staff, and donors
    - Mobile-responsive design
4. **To enhance transparency**:
    - Live dashboards showing blood group availability

### 1.4 Scope of Project

**Included Features**:

- **Blood Inventory Management**: Track units by group, expiry date.
- **Request Module**: Hospitals can place/review blood requests online.

**Target Users**:

- Blood bank staff
- Hospital administrators
- Blood donors

**Limitations**:

- Focuses on **web platforms** (mobile app development is future work).
- Excludes **blood testing logistics** (handled by lab systems).

**Impact**:

Reduces manual errors by **80% (Pridicted)** and improves emergency response times

# CHAPTER 2: SYSTEM ANALYSIS

## 2.1 Proposed System

The proposed system is a web-based Blood Bank Management System (BBMS) designed to digitize and streamline blood inventory management, donor registration, and blood request processing. It is intended for hospitals in Mahendranagar and Dhangadhi, replacing manual, paper-based systems with a centralized digital solution. The system enables real-time stock updates, automated notifications, and efficient communication between hospitals, donors, and patients.

## 2.2 Modules

1. **Admin Module (Handled by Hospitals)**
    - Login and manage system access
    - Update and monitor blood inventory
    - Approve or reject blood requests
2. **General User Module (Donors & Patients)**
    - **Donor Functions**:
        - Register and log in
        - View donation history
    - **Patient Functions**:
        - Submit blood requests
        - Check status of request
3. **Inventory Module**
    - Track available blood units by blood group
    - Low-stock alerts and expired blood notifications

## 2.3 Feasibility Study

### 2.3.1 Technical Feasibility

- Uses widely adopted technologies in Nepal: PHP, MySQL, HTML, CSS, JavaScript
- Compatible with hospital PCs and existing internet infrastructure
- Easy to host on local servers or cloud platforms if needed

The technical feasibility area can be divided into two sections:

**1)** *Hardware Requirement:*

❖ Computer or Laptop

❖ RAM (4GB or more) ❖ Hard-Disk (Minimum 50 GB or above)

**2)** *Software Requirement:*

❖ Operating System Windows 10

❖ IDE: Visual Studio Code

❖ Front End: HTML, CSS, JavaScript

❖ Back End: PHP for server-side, MySQL Database

### 2.3.2 Economic Feasibility

- Built using open-source tools, keeping costs minimal
- Reduces long-term operational costs by minimizing paperwork and blood wastage (estimated 25% cost savings)

| COMPONENT | COST |
|---|---|
| laptop | …… |
| Require software | ……. |
| Internet | 6000 |
| Miscellaneous | 3000 |
| Total | 9000 |

### 2.3.3 Time Feasibility

- Estimated development time: 3–4 months
- Matches academic project timelines and submission deadlines

| Phases | Week 1 | Week 2-4 | Week4-6 | Week 6-8 | 8-10 | 10-12 |
|---|---|---|---|---|---|---|
| Problem Identification | | | | | | |
| Requirement Gathering | | | | | | |
| System Design and Specificatin | | | | | | |
| Coding and Verification | | | | | | |
| Testing | | | | | | |
| Implementation And Management Plan | | | | | | |
| Imaintainance And Documentation | | | | | | |
| Presentation | | | | | | |

### 2.4 Functional Requirements

- **User profile** : The user should be able to view their own profile, modify their details and change password.
- **Login:** Secure login system with role-based access (Hospital(Admin/Staff), GeneralUser (Doner/Patient))
- **Logout** : the user should be able to logout of the system
- Blood request and approval workflow.
- Real-time dashboard showing blood availability and request status

### 2.5 Non-Functional Requirements

- PERFORMANCE:
    - Fast Response Time for User Login
    - The average response time for user login after entering user name and password should be no more than 3 sec and the maximum response time should be 10 seconds.
    - Fast Average Time for Rendering a Page
    - The application should be able to address at least 600 users concurrently.
- USABILITY:
    - Usability is crucial in website development. Because whether you are doing online search or online application, the page for users to make him easy and fun to use is a key; efficient to use, easy to use and consistent interface can help enhance usability.
    - - Efficient to use.
        - Easy to use.
        - Consistent interfac
- **Security**: Encryption of sensitive data such as donor and patient information

# CHAPTER 3: SYSTEM DESIGN

## 3.1 Introduction to Design

System design is the process of defining the architecture, components, modules, interfaces, and data for a system to satisfy specified requirements. In the Blood Bank Management System, the design focuses on ensuring smooth blood inventory management, donation recording, handling of expired blood, and proper user management (Admin, Staff, and General User). A well-planned design ensures the system is efficient, scalable, secure, and user-friendly.

In system design, designers model how users will interact with the system and how data will flow through different modules. A systems approach to design helps identify:

- What the system is and what its environment is.
- What goals the system must achieve (e.g., maintain blood inventory, fulfill blood requests).
- How feedback loops (e.g., donation updates, expired blood alerts) correct and guide system operations.

**When to use Systems Design:**
A systems approach is most appropriate for large-scale projects like this, where multiple users interact, processes are complex, and different components must be coordinated for smooth functioning. Solo, simple applications may not require such a detailed design.

**Types of System Design in Blood Bank Management System:**

**Logical Design:**

Logical design defines *what* the system must do, independent of how it will be physically implemented. In our project, it includes entities like Blood, User, Donation, and Request, and their relationships and rules (such as validation of user registration and donation records).

Logical design involves:

1. Mapping entities and relationships.
2. Normalizing the database structure.
3. Ensuring data integrity and validation rules.
4. Matching user requirements (easy blood request, proper inventory tracking).

**Physical Design:**

Physical design focuses on *how* the system will actually work — input methods, data processing, and output displays.

Physical design involves:

5. **User Interface Design:** Forms for user registration, blood donation entry, and request submission.
6. **Data Design:** Storing blood information with attributes like group, quantity, expiry date.
7. **Process Design:** Managing blood stock updates, handling user login/authentication, and processing blood requests.

*Example:*
*When a General User requests blood, the system takes the input through a form (UI Design), processes the request by checking available stock (Process Design), and then updates the inventory and notifies the staff/admin (Output).*

## 3.2 UML Diagrams

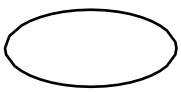
Unified Modeling Language (UML) diagrams provide a graphical representation of the system's structure and behavior. They help in understanding, designing, and documenting the components of the system effectively. For the Blood Bank Management System, UML diagrams like Use Case Diagram, Sequence Diagram, and State Diagram are prepared to illustrate the system's functionalities.

Actor:

A coherent set of roles that user of use case plays when interacting with the use cases.

Use cases:

A description of sequences of actions, including variants, that a system performs that yields an observable result of value of an actor.



### 3.3 Use Case Diagram

The Use Case Diagram depicts the interactions between users (actors) and the system. In this project, the main actors are:

- **Admin**: Appoints staff, manages users, manages blood inventory.
- **Staff**: Handles blood donations, manages expired blood.
- **General User**: Registers their account, requests blood, views available blood types.

**Key Use Cases:**

- Manage Blood Inventory
- Record Blood Donation
- Manage Expired Blood
- Register as General User
- Approve or Remove Users (by Admin)
- Request for Blood (by General User)

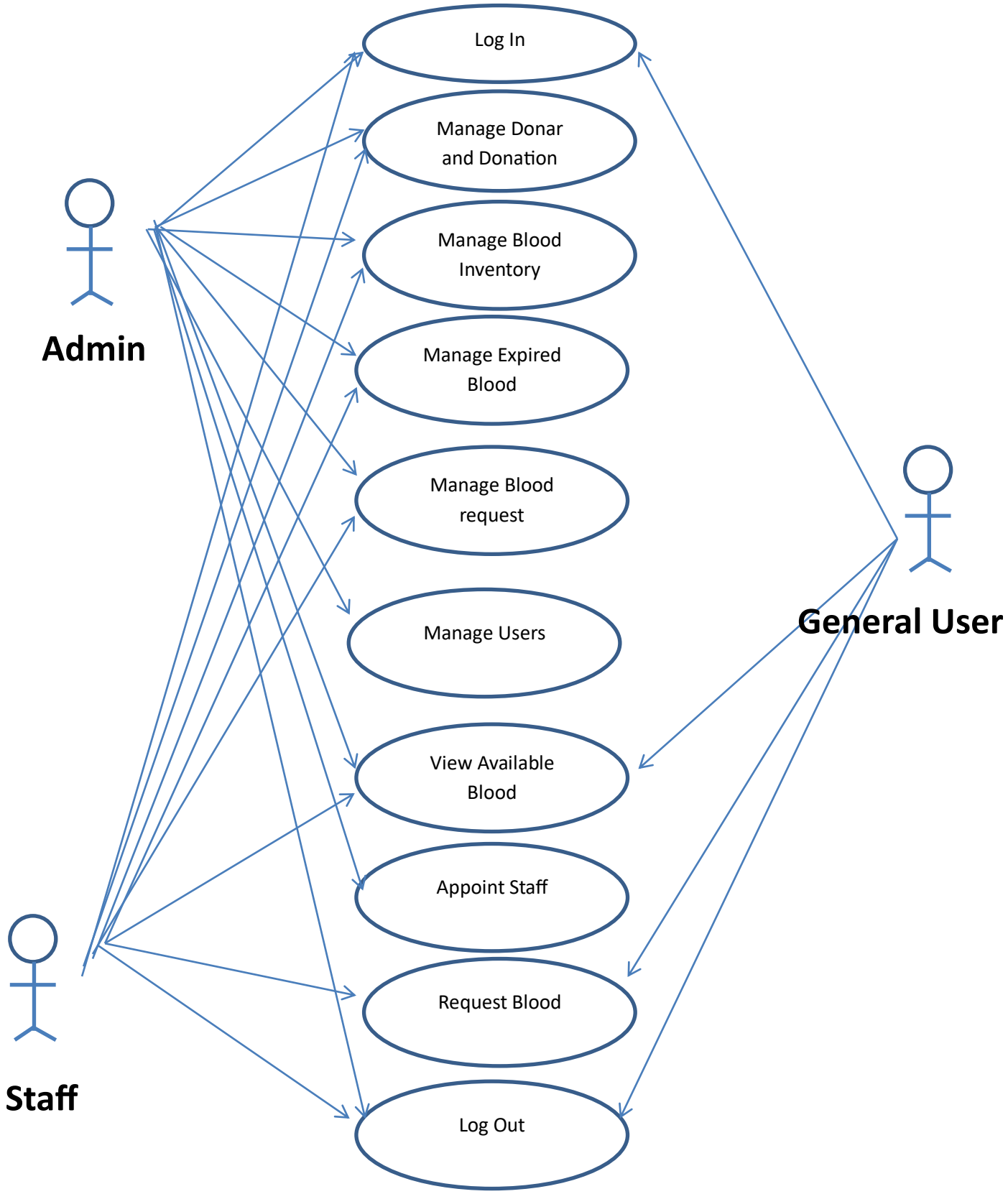



**Fig: Use Case Diagram of Blood Bank Management System**

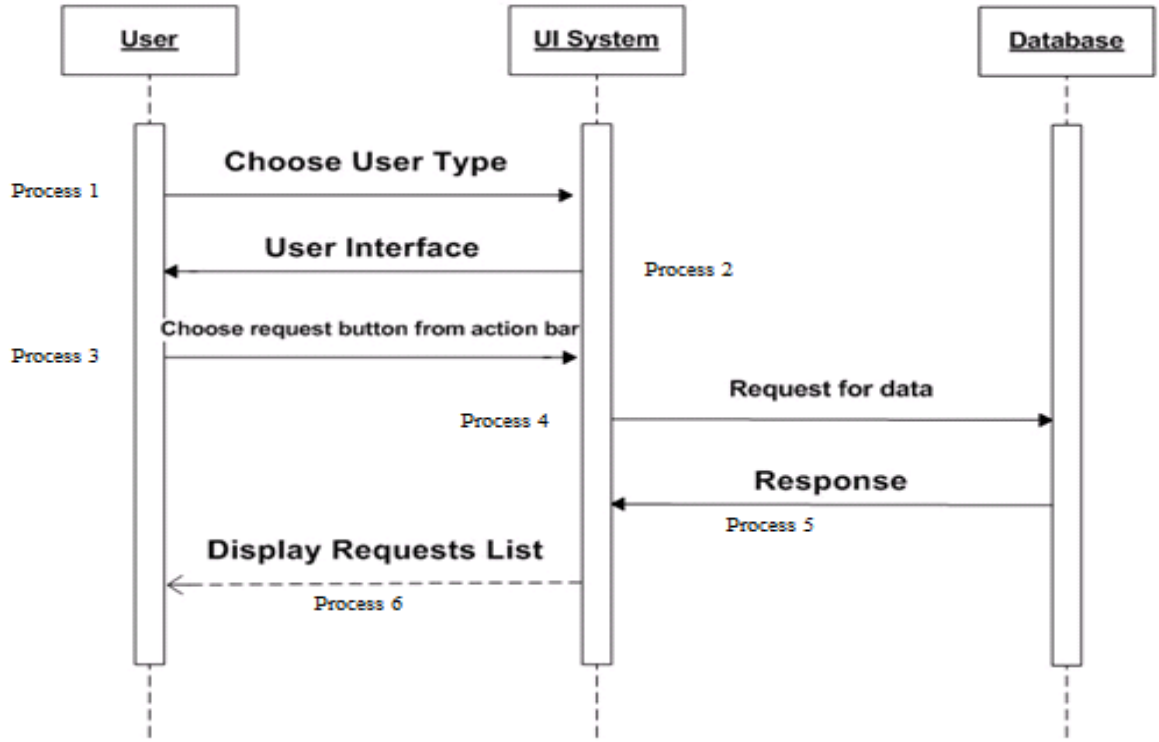
### 3.4 Sequence Diagram

The Sequence Diagram shows how objects interact in a particular scenario of a use case. It focuses on the sequence of messages exchanged.

**Example Sequence: Requesting Blood**

1. General User logs into the system.
2. General User views available blood stock.
3. General User places a request for blood.
4. System checks inventory and confirms the request.
5. Staff/ Admin approves the request and updates inventory.

**View Requests:**



## 3.5 State Diagram

The State Diagram represents the various states of the system or a specific object and how it transitions from one state to another based on events.

**Example: Blood Bag Lifecycle**

- **Donated → Tested → Available in Inventory → Requested/Reserved → Issued**
  or
- **Available in Inventory → Expired**

## 3.6 Data Flow Diagram (DFD)

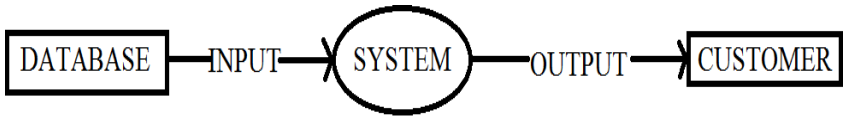
A Data Flow Diagram represents the flow of data within the system. It shows how information moves from input to processing and output.

**Main Data Flows:**

- Blood donation data flows from Staff to Inventory database.
- Blood request data flows from General User to the Blood Inventory.
- Admin updates or removes users and staff information in the User database.
- Expired blood reports are generated based on Inventory data.

**Entities:**

- User
- Admin
- Staff
- Blood Inventory
- Blood Request
- Donation Records
- Expired Blood Records




***DATA FLOW DIAGRAM***

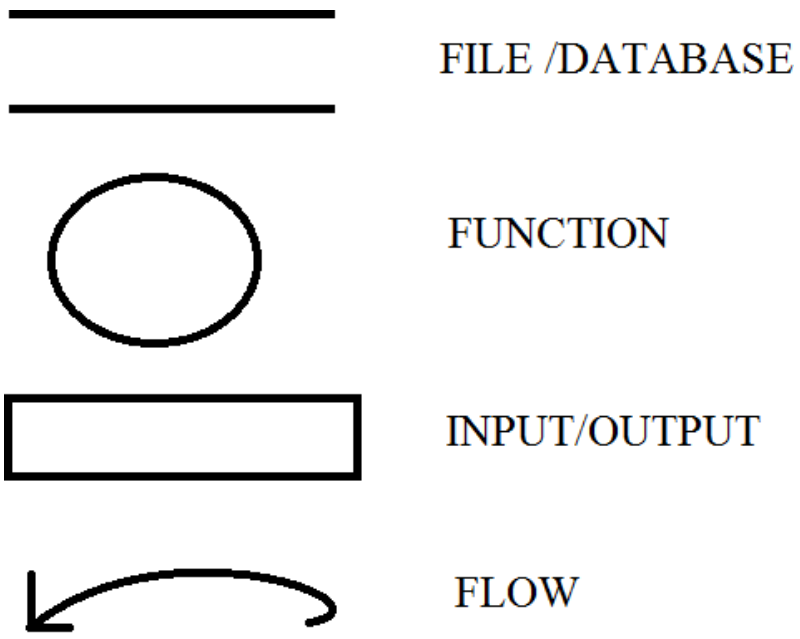
**Data flow diagram Symbols**:

External entities: rectangular box

Data flow: arrow headed lines

Process/ function: bubble/ circle.

Data store: narrow opened rectangle.




***DFD SYMBOLS***

A data flow diagram represents the following:

- External devices sending or receiving data.
- Processes that change the data.
- Data flow themselves.
- Data storage locations.

## 3.7 Entity-Relationship (ER) Diagram

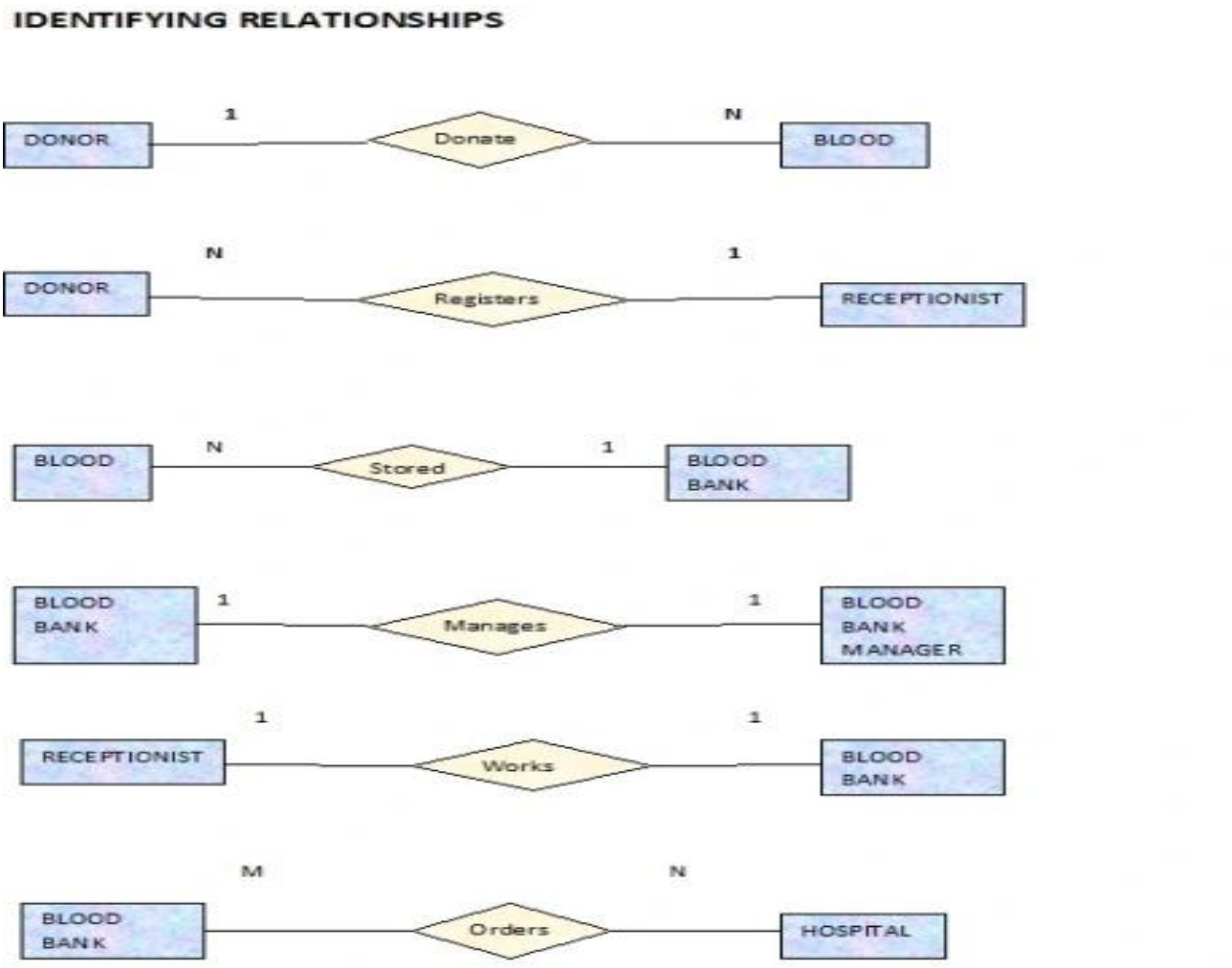
The ER Diagram visually represents the relationships between different entities in the system.

**Main Entities:**

- **User** (Attributes: user_id, name, email, password, role [Admin/Staff/General User])
- **Blood** (Attributes: blood_id, blood_group, quantity, donation_date, expiry_date, status)
- **Donation** (Attributes: donation_id, user_id, blood_id, donation_date)
- **Request** (Attributes: request_id, user_id, blood_group, quantity, request_date, status)

**Relationships:**

- User can donate Blood.
- User can request Blood.
- Admin manages Staff and General Users.
- Blood status updates over time (Available, Issued, Expired).



# Chapter 4: CODING AND TESTING

## 4.1 CODING

In this phase, the software design of the Blood Bank Management System is translated into source code using various programming languages. It is the main phase of the software development process, where the logical design is converted into a working system.

For this project:

- **Front-end** development is done using **HTML**, **CSS**, and **JavaScript** to create user-friendly interfaces for Admin, Staff, and General Users.
- **Back-end** development uses **PHP** for server-side operations such as handling blood donation entries, inventory updates, and user authentication.
- **MySQL** is used to manage the database, where tables like User, Blood Inventory, Donation Records, and Requests are maintained.
- **Visual Studio Code** is used as the primary code editor for writing, editing, and managing the project files.

## 4.2 TESTING TECHNIQUES

The primary objective for test case design in this project is to uncover defects early and ensure that the Blood Bank Management System works smoothly across all modules.During development, **two types of testing techniques** were applied:

### 4.2.1 White Box Testing

- This testing was done with knowledge of the internal logic and code structure.
- Test cases were written to check the correct working of internal functionalities like:
  - Blood inventory updates
  - Expired blood identification
  - User login authentication
- Techniques used: Control Flow Testing, Path Testing.

### 4.2.2 Black Box Testing

- This testing was done without knowing the internal implementation.
- Test cases were focused on:
  - User registration and login
  - Blood donation form submission
  - Blood request form validation
- Techniques used: Equivalence Partitioning, Boundary Value Analysis.

Both white-box and black-box testing were crucial to verify the system functionality from both programmer and user perspectives.

## 4.3 TESTING STRATEGIES

In our Blood Bank Management System, a combination of **Top-Down Testing** and **Bottom-Up Testing** strategies was adopted:

- **Top-Down Testing:**
  - Started by testing major modules like User Management, Blood Inventory, and Donation Processing.
  - Dummy sub-components (stubs) were used initially to simulate modules like Request Handling.
  - Helped us identify structural issues early and allowed early user demonstrations.
- **Bottom-Up Testing:**
  - Individual components like Login Form, Donation Form, and Expiry Check Module were first tested separately.
  - Then they were integrated gradually into larger modules.
  - Ensured that each small part of the system was working correctly before full integration.

This hybrid strategy allowed efficient detection of errors at both module and system levels.

## 4.4 TEST CASES

### Test Case for Registration

| Steps | Procedure | Expected Results | Pass/Fail |
|---|---|---|---|
| 1. | Goto Register Page | View form for Registration | Pass |
| 2. | Fill up the form With Required Entities | -- | Pass |
| 3. | Tap on “Submit” button | Alert message “New User Registered Successfully” | Pass |

Table: Test Case for Registration

### Test Case for Login

| Steps | Procedure | Expected Results | Pass/Fail |
|---|---|---|---|
| 1. | Goto Login Page | View form for login | Pass |
| 2. | Fill up the form With Username and Password | -- | Pass |
| 3. | Tap on “Login” button | Successfully logged in | Pass |

Table: Test Case for Registration

## 4.5 IMPLEMENTATION

During the implementation of the Blood Bank Management System, the development team faced several challenges:

- **Code Reuse:**
  While developing, previous PHP snippets and templates were reused to maintain consistency and reduce development time. Compatibility issues and slight customizations were required to match the new system requirements.

- **Version Management:**
  As new features (e.g., managing expired blood) were added, maintaining version history and backups was necessary to avoid overwriting stable versions.

- **Target-Host Issues:**
  The system was designed primarily for hosting on a local server (XAMPP), but careful attention was paid to ensure it can be deployed easily to live web hosting environments when needed.

Despite these challenges, the implementation was successfully completed following systematic planning and modular development.

## 4.6 MAINTENANCE

Software maintenance is a critical part of the system's lifecycle. For the Blood Bank Management System:

- Regular updates are planned to improve functionalities such as enhancing user experience for donors and requesters.
- Security patches and data validation measures are applied to protect user information and blood inventory data.
- Adjustments are made whenever real-world practices (such as new blood donation rules) change, ensuring the software stays relevant and effective.

Continuous monitoring and updating help in maintaining the system's performance, reliability, and accuracy over time.

# CHAPTER 5: RESULTS AND DISCUSSION

## 5.1 Achieved Objectives

The main objectives of the Blood Bank Management System were successfully achieved:

- Developed a fully functional web-based system for blood donors, patients, and hospital administrators.
- Implemented user registration, login, blood donation management, and blood request modules.
- Enabled hospitals to manage available blood inventory and approve or reject requests.
- Allowed general users to request blood easily without needing physical visits.
- Designed a user-friendly interface using HTML, CSS, JavaScript, PHP, and MySQL.
- Ensured basic system security and database management for smooth operations.

## 5.2 Challenges and Solutions

During the development of the project, several challenges were encountered:

- **Database Management:** Managing the blood inventory database required careful planning.
  *Solution:* Structured tables and queries carefully to handle blood group categorization and availability.
- **User Interface Design:** Designing a simple yet effective UI for different user roles (donor, patient, admin) was challenging.

- **Session and Security Handling:** Protecting user sessions and form data was crucial.

- **Testing Across Devices:** Ensuring the system worked properly on different devices and browsers.
  *Solution:* Manually tested the system across multiple browsers and screen sizes.

## 5.3 Comparison with Existing Systems

Compared to traditional blood bank systems and some existing online platforms:

- Our system provides a more streamlined interface for both donors and patients.
- Many existing blood bank systems have limited donor engagement features. Our system encourages donor registration and activity through easy accessibility.
- Some hospital websites only provide static information; our system offers **dynamic functionalities** like real-time blood request and inventory update.
- The project aims for future integration of features like notification systems, smart inventory alerts, and mobile app development, which many existing systems currently lack.

# 6. LIMITATIONS

## *6.1 System Limitations*

- **Internet Dependency:** The application requires an active Internet connection; no offline functionality is available.
- **English-Only Interface:** All menus, forms, and messages are in English.
- **Web-Only Access:** Currently there is no dedicated mobile app; users must access the system via a desktop or mobile browser.
- **Manual Data Entry:** Blood donations, requests, and user registrations are entered by hand, which may introduce typos or inconsistencies.
- **No External Integration:** The system does not yet connect with external hospital/EHR systems or blood-bank networks.
- **Lack of Automated Alerts:** There is no built-in SMS or email notification for donation reminders, request status changes, or expiry warnings.

## *6.2 Limitations to Be Enhanced in Future*

- **In-App Chat/Messaging:** Enable real-time communication between donors, staff, and administrators.
- **Automated Notifications:** Add SMS/email alerts for upcoming donation eligibility, blood expiry, and request approvals.
- **Mobile Applications:** Develop native Android and iOS apps for on-the-go access.
- **Multilingual Support:** Offer the interface in Nepali and other regional languages.
- **API Integrations:** Connect with hospital information systems (via RESTful APIs) for seamless data exchange.

## 7. CONCLUSION

The Blood Bank Management System has been designed in a flexible and scalable way, allowing future modifications and enhancements to be easily implemented. The following conclusions can be drawn from the development of this project:

In the past, blood donation management, inventory tracking, and blood requests were mostly done manually, leading to inefficiency, delays, and errors. However, with the development of this web-based system, all major operations of a blood bank have been streamlined and digitized. Through the power of the internet, hospitals, staff, donors, and patients can now interact with the system in real-time, improving the overall process of blood management and availability. General users can register online, donate blood, and request blood units easily. Staff and admin users can manage donations, inventories, and expired blood efficiently through their respective dashboards.

The Blood Bank Management System provides several advantages:

- **Allows users to register, donate blood, and request blood online without visiting physically.**
- **Connects donors and recipients effectively, saving valuable time in emergency situations.**
- **Manages blood inventory systematically, ensuring proper tracking of available and expired blood units.**
- **Reduces paperwork and manual errors by automating donation, request, and inventory processes.**
- **Provides an easy and user-friendly interface for Admin, Staff, and General Users.**
- **Ensures faster access to blood units when needed, potentially saving more lives.**

Overall, the system has made the blood donation and blood management process faster, more reliable, and more accessible to all users, contributing positively to healthcare services.

## 8. FUTURE ENHANCEMENTS

The future development of this **Blood Bank Management System** depends on the availability of time and resources in the coming months. Several features still need to be incorporated to fully round off the system. If the system were to be commercialized or deployed at scale, the following steps would be necessary:

### □ Security & Compliance

- Role-based access control with optional biometric login
- Audit trails (e.g., blockchain-backed logs) and GDPR/HIPAA adherence

### □ Mobile & Real-Time Access

- A cross-platform mobile app for donors to book slots, view history, and get alerts
- Emergency-only portal for hospitals to place urgent requests

### □ Smart Analytics & Inventory Tracking

- AI-driven demand forecasting and donor-engagement reminders
- RFID/QR-based blood bag tracking and IoT-powered expiry/temperature alerts

- **Subscription Model for Commercial Use**:

  If the system were to be commercialized, a subscription model could be implemented, offering premium features like advanced analytics, custom reporting, or multi-branch support. Regular updates and maintenance would be necessary to address evolving user needs and improve system performance.

## 9. RECOMMENDATIONS

- **Adapting to User Needs:** The system cannot meet all user requirements at once. As it's used, continuous feedback will help refine and improve it.
- **Future Enhancements:** The system should evolve with new features such as real-time notifications, mobile apps, and advanced analytics based on user needs.
- **Technological Upgrades:** As technology advances, the system should remain adaptable to incorporate AI, IoT, and cloud-based solutions for scalability and performance.
- **Improving Security:** Security should be continually enhanced using emerging technologies like biometric authentication, blockchain for traceability, and encryption to stay ahead of cyber threats.

## 10. REFERENCES AND BIBLIOGRAPHY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9. Teacher's Notes and Lectures.
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# Source Code

## Login.php

```
<?php
// Initialize the session
session_start();
// Check if the user is already logged in, if yes then redirect to dashboard
if(isset($_SESSION["loggedin"]) && $_SESSION["loggedin"] === true){
    header("location: index.php");
    exit;
}
// Include database connection file
require_once "config/database.php";
// Define variables and initialize with empty values
$username = $password = "";
$username_err = $password_err = $login_err = "";
// Processing form data when form is submitted
if($_SERVER["REQUEST_METHOD"] == "POST"){
    // Check if username is empty
    if(empty(trim($_POST["username"]))){
        $username_err = "Please enter username.";
    } else{
        $username = trim($_POST["username"]);
    }
    // Check if password is empty
    if(empty(trim($_POST["password"]))){
        $password_err = "Please enter your password.";
    } else{
        $password = trim($_POST["password"]);
    }
    // Validate credentials
    if(empty($username_err) && empty($password_err)){
        // Prepare a select statement
        $sql = "SELECT id, username, password, name, role FROM users WHERE username = ?";
        if($stmt = mysqli_prepare($conn, $sql)){
            // Bind variables to the prepared statement as parameters
            mysqli_stmt_bind_param($stmt, "s", $param_username);
            // Set parameters
            $param_username = $username;
            // Attempt to execute the prepared statement
            if(mysqli_stmt_execute($stmt)){
                // Store result
                mysqli_stmt_store_result($stmt);
                // Check if username exists, if yes then verify password
                if(mysqli_stmt_num_rows($stmt) == 1){
                    // Bind result variables
                    mysqli_stmt_bind_result($stmt, $id, $username, $hashed_password, $name, $role);
                    if(mysqli_stmt_fetch($stmt)){
                        if(password_verify($password, $hashed_password)){
                            // Password is correct, so start a new session
                            session_start();
```

```
                        // Store data in session variables
                        $_SESSION["loggedin"] = true;
                        $_SESSION["id"] = $id;
                        $_SESSION["username"] = $username;
                        $_SESSION["name"] = $name;
                        $_SESSION["role"] = $role;
                        // Redirect user to welcome page
                        header("location: index.php");
                    } else{
                        // Password is not valid
                        $login_err = "Invalid username or password.";
                    }
                }
            } else{
                // Username doesn't exist
                $login_err = "Invalid username or password.";
            }
        } else{
            echo "Oops! Something went wrong. Please try again later.";
        }
        // Close statement
        mysqli_stmt_close($stmt);
    }
  }
  // Close connection
  mysqli_close($conn);
}
?>
<!DOCTYPE html>
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Login - Blood Bank Management System</title>
  <link rel="stylesheet" href="assets/css/style.css">
  <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.4/css/all.min.css">
</head>
<body class="login-page">
  <div class="login-container">
    <div class="login-header">
      <h2><i class="fas fa-tint"></i> Blood Bank Management System</h2>
    </div>
    <?php
    if(!empty($login_err)){
      echo '<div class="alert alert-danger">' . $login_err . '</div>';
    }
    ?>
    <form action="<?php echo htmlspecialchars($_SERVER["PHP_SELF"]); ?>" method="post" class="login-form">
      <div class="form-group">
        <label>Username</label>
        <input type="text" name="username" class="form-control <?php echo (!empty($username_err)) ? 'is-invalid' : '';
?>" value="<?php echo $username; ?>">
        <span class="invalid-feedback"><?php echo $username_err; ?></span>
      </div>
```

```
        <div class="form-group">
            <label>Password</label>
            <input type="password" name="password" class="form-control <?php echo (!empty($password_err)) ? 'is-invalid'
: ''; ?>">
            <span class="invalid-feedback"><?php echo $password_err; ?></span>
        </div>
        <div class="form-group">
            <button type="submit" class="btn btn-primary">Login</button>
        </div>
        <p>Don't have an account? <a href="register.php">Register here</a>.</p>
    </form>
  </div>
  <script src="assets/js/script.js"></script>
</body>
</html>
```

# Index.php

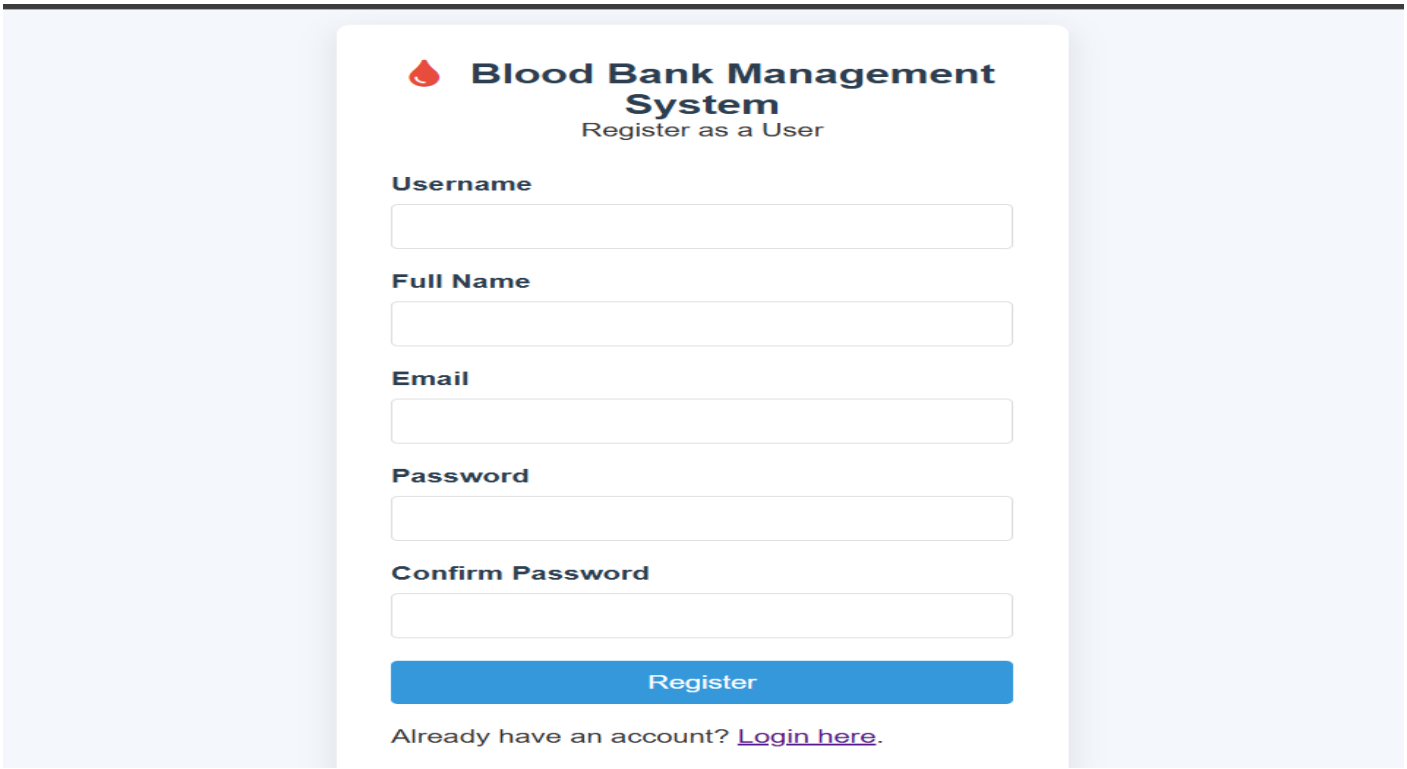
```
<?php
session_start();
include_once 'config/database.php';

// Redirect to login if not logged in
if(!isset($_SESSION["loggedin"]) || $_SESSION["loggedin"] !== true){
  header("location: login.php");
  exit;
}

$blood_query = "SELECT * FROM blood_inventory";
$blood_result = mysqli_query($conn, $blood_query);

$donors_query = "SELECT COUNT(*) as total_donors FROM donors";
$donors_result = mysqli_query($conn, $donors_query);
$donors_data = mysqli_fetch_assoc($donors_result);

$donations_query = "SELECT COUNT(*) as total_donations FROM blood_donations";
$donations_result = mysqli_query($conn, $donations_query);
$donations_data = mysqli_fetch_assoc($donations_result);

$requests_query = "SELECT COUNT(*) as total_requests FROM blood_requests WHERE status='Pending'";
$requests_result = mysqli_query($conn, $requests_query);
$requests_data = mysqli_fetch_assoc($requests_result);
?>

<!DOCTYPE html>
```

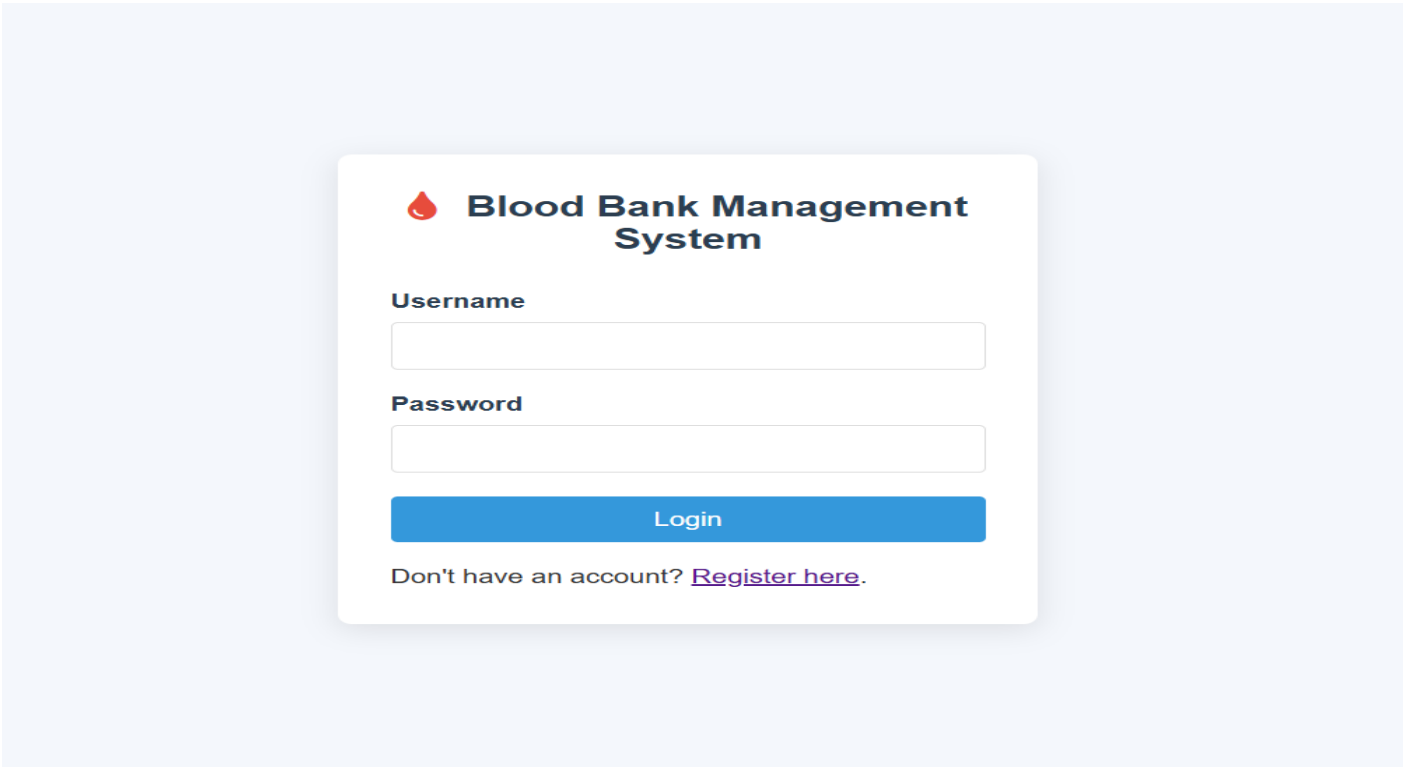
```
<html lang="en">
<head>
  <meta charset="UTF-8">
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Blood Bank Management System</title>
  <link rel="stylesheet" href="assets/css/style.css">
  <link rel="stylesheet" href="assets/css/dashboard-bg.css">
  <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.4/css/all.min.css">
  <style>
    .full-width-dashboard {
      display: grid;
      grid-template-columns: repeat(1, 1fr);
      gap: 20px;
    }

    .full-width-card {
      width: 100%;
      background-color: #fff;
      border-radius: 8px;
      box-shadow: 0 2px 10px rgba(0, 0, 0, 0.05);
      padding: 30px;
      display: flex;
      align-items: center;
    }

    .full-width-card:last-child {
      margin-bottom: 30px;
    }

    .full-width-card .card-icon {
      font-size: 36px;
      margin-right: 20px;
      margin-bottom: 0;
    }

    .full-width-card .card-info {
      flex-grow: 1;
    }

    .full-width-card .card-link {
      margin-top: 0;
      padding: 10px 20px;
      background-color: #3498db;
      color: white;
      border-radius: 4px;
      text-decoration: none;
    }

    .full-width-card .card-link:hover {
      background-color: #2980b9;
      text-decoration: none;
    }
  </style>
</head>
<body>
  <?php include 'includes/header.php'; ?>
  <div class="wrapper">
    <?php include 'includes/sidebar.php'; ?>

    <div class="main-content">
      <div class="header">
        <h1>Dashboard</h1>
```

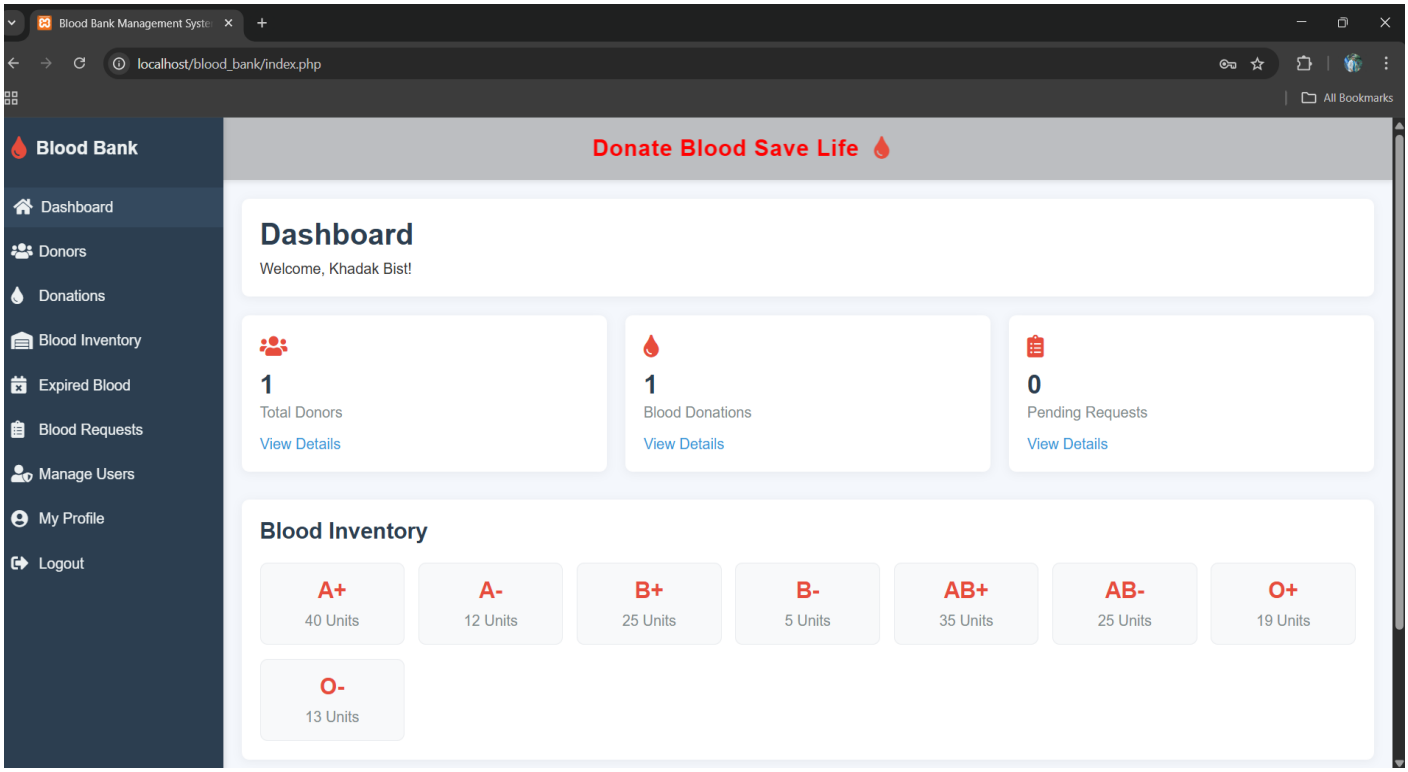
```
    <p>Welcome, <?php echo htmlspecialchars($_SESSION["name"]); ?>!</p>
</div>

<?php if($_SESSION["role"] !== "user"): // Admin/staff view ?>
<div class="dashboard-container">
    <div class="dashboard-background"></div>
    <div class="dashboard">
        <div class="dashboard-card">
            <div class="card-icon"><i class="fas fa-users"></i></div>
            <div class="card-info">
                <h2><?php echo $donors_data['total_donors']; ?></h2>
                <p>Total Donors</p>
            </div>
            <a href="donors.php" class="card-link">View Details</a>
        </div>

        <div class="dashboard-card">
            <div class="card-icon"><i class="fas fa-tint"></i></div>
            <div class="card-info">
                <h2><?php echo $donations_data['total_donations']; ?></h2>
                <p>Blood Donations</p>
            </div>
            <a href="donations.php" class="card-link">View Details</a>
        </div>

        <div class="dashboard-card">
            <div class="card-icon"><i class="fas fa-clipboard-list"></i></div>
            <div class="card-info">
                <h2><?php echo $requests_data['total_requests']; ?></h2>
                <p>Pending Requests</p>
            </div>
            <a href="requests.php" class="card-link">View Details</a>
        </div>
    </div>
</div>
<?php else: // Regular user view ?>
<div class="dashboard-container">
    <div class="dashboard-background"></div>
    <div class="full-width-dashboard">
        <div class="full-width-card">
            <div class="card-icon"><i class="fas fa-heartbeat"></i></div>
            <div class="card-info">
                <h2>Blood Request</h2>
                <p>Request blood for patients in need</p>
            </div>
            <a href="requests.php" class="card-link">Request Blood</a>
        </div>

        <div class="full-width-card">
            <div class="card-icon"><i class="fas fa-history"></i></div>
            <div class="card-info">
                <h2>Request History</h2>
                <p>Track your blood requests</p>
            </div>
            <a href="requests.php" class="card-link">View Requests</a>
        </div>
    </div>
</div>
<?php endif; ?>

<div class="blood-inventory">
    <h2>Blood Inventory</h2>
```

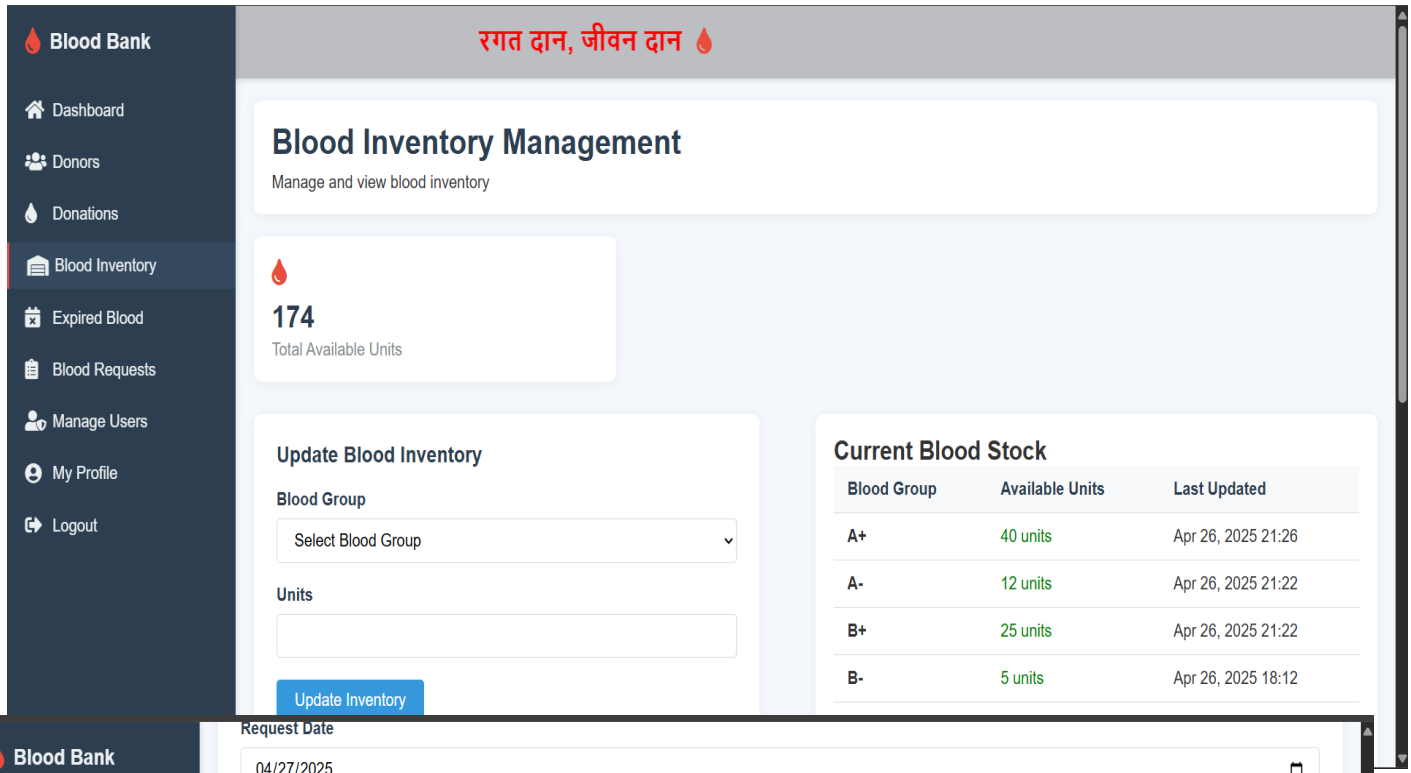
```
            <div class="inventory-container">
                <?php while($blood = mysqli_fetch_assoc($blood_result)): ?>
                <div class="blood-group">
                    <div class="blood-type"><?php echo $blood['blood_group']; ?></div>
                    <div class="blood-units"><?php echo $blood['units']; ?> Units</div>
                </div>
                <?php endwhile; ?>
            </div>
        </div>
    </div>
</div>

<script src="assets/js/script.js"></script>
<?php include 'includes/footer.php'; ?>
</body>
</html>
```

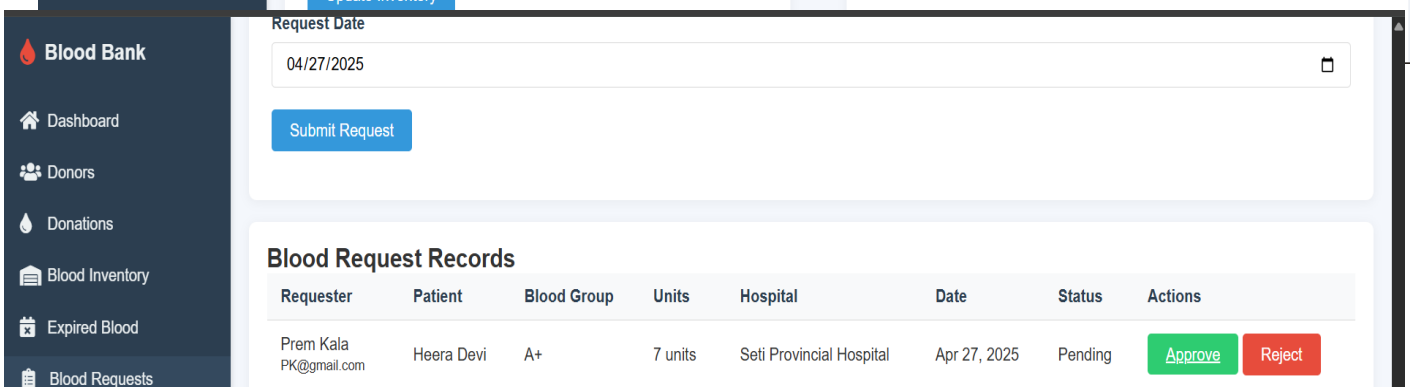
# Screenshots

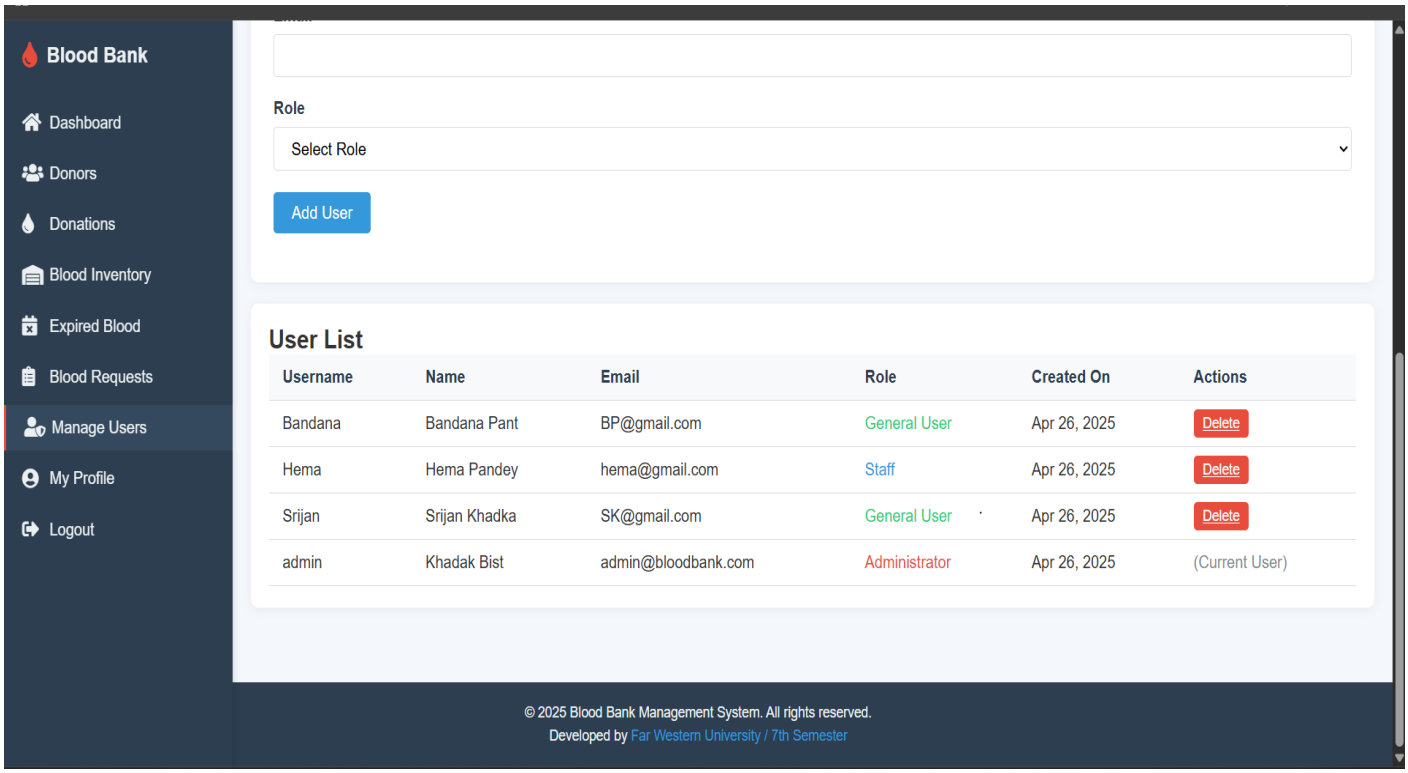



Blood Bank Management Syste
localhost/blood_bank/index.php
All Bookmarks
Blood Bank
Donate Blood Save Life
Dashboard
Donors
Donations
Blood Inventory
Expired Blood
Blood Requests
Manage Users
My Profile
Logout
Dashboard
Welcome, Khadak Bist!
1
Total Donors
View Details
1
Blood Donations
View Details
0
Pending Requests
View Details
Blood Inventory
A+
40 Units
A-
12 Units
B+
25 Units
B-
5 Units
AB+
35 Units
AB-
25 Units
O+
19 Units
O-
13 Units


Blood Bank
रगत दान, जीवन दान
Dashboard
Donors
Donations
Blood Inventory
Expired Blood
Blood Requests
Manage Users
My Profile
Logout
Blood Inventory Management
Manage and view blood inventory
174
Total Available Units
Update Blood Inventory
Blood Group
Select Blood Group
Units
Update Inventory
Current Blood Stock
Blood Group
Available Units
Last Updated
A+
40 units
Apr 26, 2025 21:26
A-
12 units
Apr 26, 2025 21:22
B+
25 units
Apr 26, 2025 21:22
B-
5 units
Apr 26, 2025 18:12


Blood Bank
Dashboard
Donors
Donations
Blood Inventory
Expired Blood
Blood Requests
Request Date
04/27/2025
Submit Request
Blood Request Records
Requester
Patient
Blood Group
Units
Hospital
Date
Status
Actions
Prem Kala
PK@gmail.com
Heera Devi
A+
7 units
Seti Provincial Hospital
Apr 27, 2025
Pending
Approve
Reject


Blood Bank
Dashboard
Donors
Donations
Blood Inventory
Expired Blood
Blood Requests
Manage Users
My Profile
Logout
Role
Select Role
Add User
User List
Username
Name
Email
Role
Created On
Actions
Bandana
Bandana Pant
BP@gmail.com
General User
Apr 26, 2025
Delete
Hema
Hema Pandey
hema@gmail.com
Staff
Apr 26, 2025
Delete
Srijan
Srijan Khadka
SK@gmail.com
General User
Apr 26, 2025
Delete
admin
Khadak Bist
admin@bloodbank.com
Administrator
Apr 26, 2025
(Current User)
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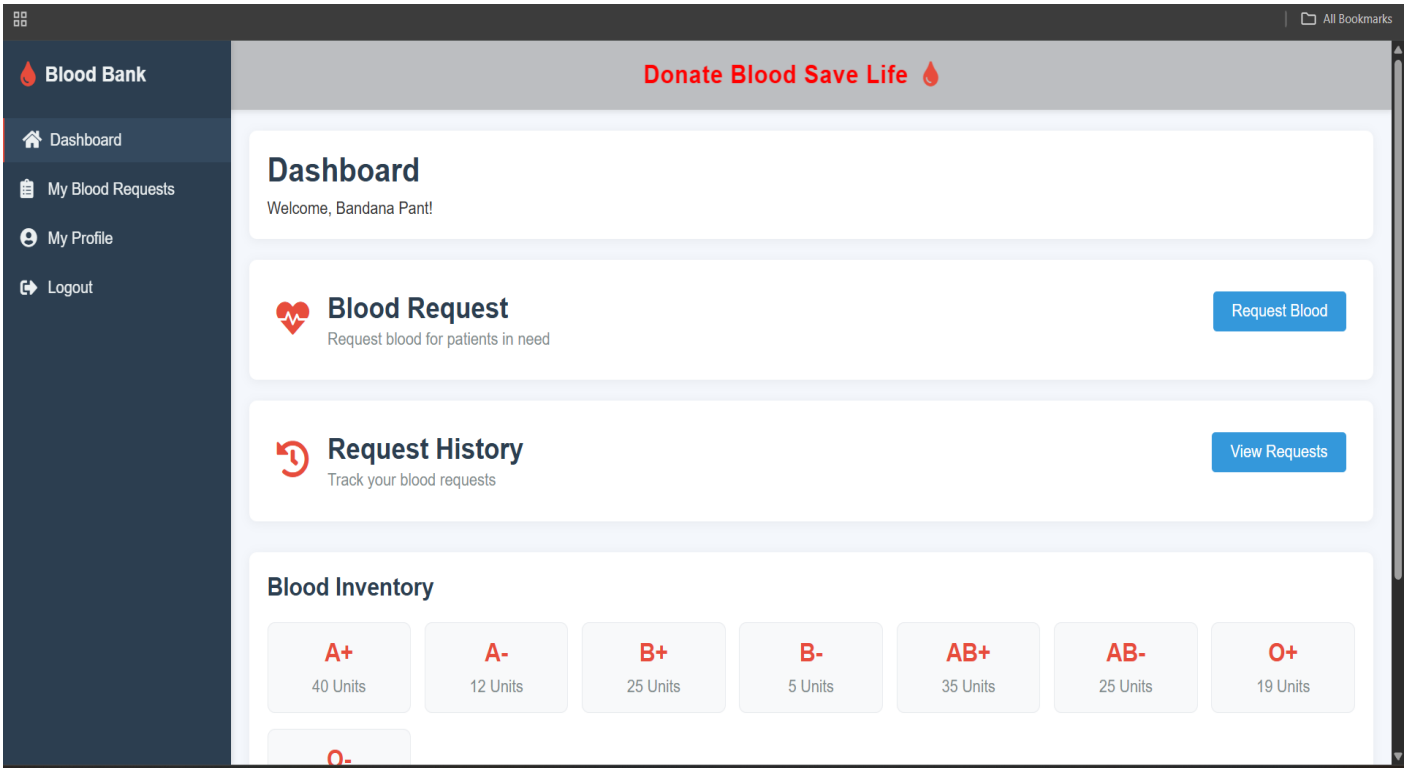
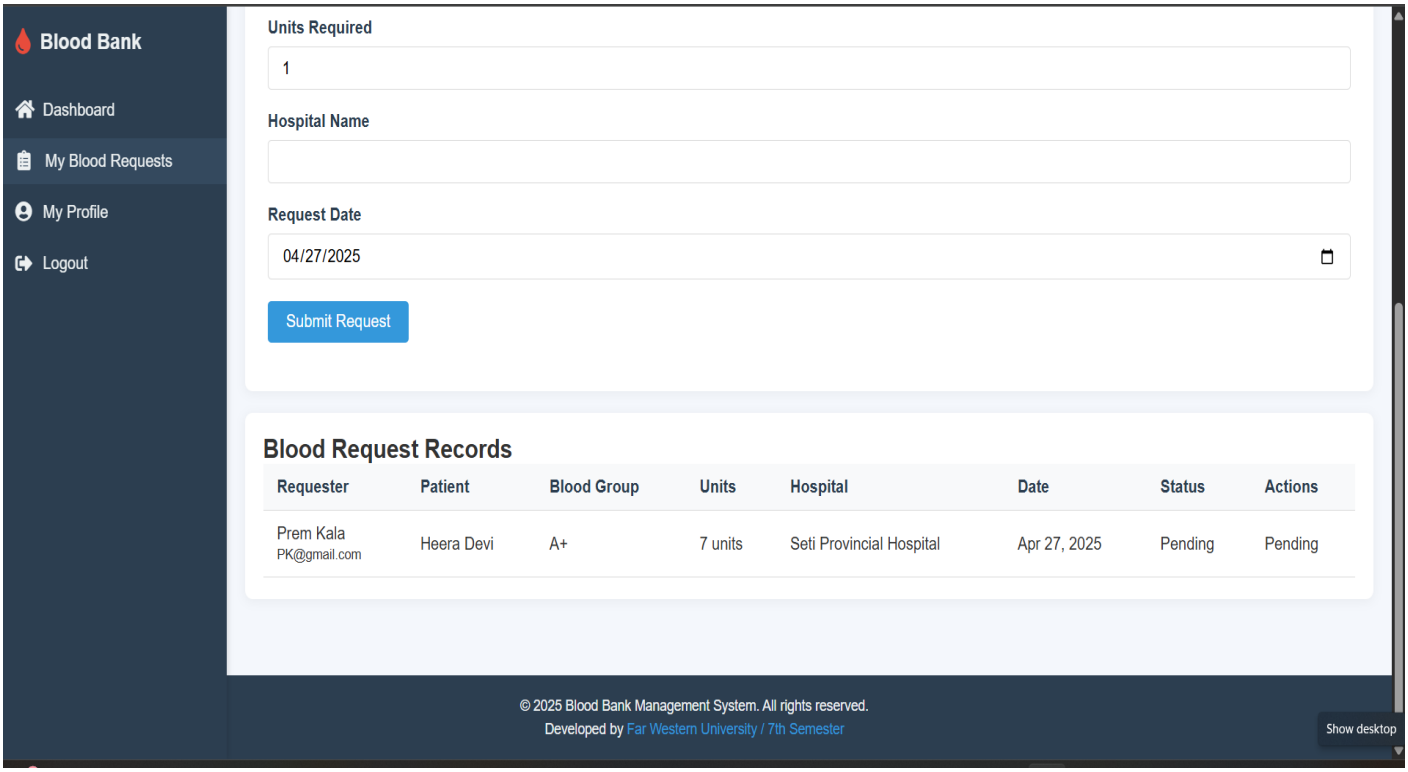

All Bookmarks
Blood Bank
Donate Blood Save Life
Dashboard
My Blood Requests
My Profile
Logout
Dashboard
Welcome, Bandana Pant!
Blood Request
Request blood for patients in need
Request Blood
Request History
Track your blood requests
View Requests
Blood Inventory
A+
40 Units
A-
12 Units
B+
25 Units
B-
5 Units
AB+
35 Units
AB-
25 Units
O+
19 Units
O-


Blood Bank
Dashboard
My Blood Requests
My Profile
Logout
Units Required
1
Hospital Name
Request Date
04/27/2025
Submit Request
Blood Request Records
Requester
Patient
Blood Group
Units
Hospital
Date
Status
Actions
Prem Kala
PK@gmail.com
Heera Devi
A+
7 units
Seti Provincial Hospital
Apr 27, 2025
Pending
Pending
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Show desktop