Module Code & Module Title

CS5003NI Data Structures and Specialist Programming

30% Individual Coursework 1

Submission: Milestone 1.

Academic Semester: AY 2025/2026

Credit: 30 credit year long module

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Project Title: Prison Management System

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Assignment Due Date: 26/12/2025

Assignment Submission Date: 26/12/2025

Submitted To: Subarna Sapkota

GitHub Link	**https://github.com/anjalbhattarai79/Prison-management-system.git**

TURNITIN REPORT

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1. Introduction

Prison administration is an inherently complex task that requires careful management of dynamic records, fairness in judicial processing, and adaptability to fluctuating inmate populations. In many countries, including Nepal, the scale of these challenges is compounded by systemic issues such as overcrowding, inadequate facilities, and inefficient case management. For example, the combined capacity of Nepal's prison system is approximately 16,556 inmates, yet official data shows more than 24,000 prisoners currently housed nationwide, reflecting overcrowding of roughly 46.56% above capacity (Kathmandu School of Law Review, 2022). The failure to balance prison capacity with population has profound consequences. Overcrowded conditions are linked with heightened interpersonal conflict, degraded living environments, limited access to health services, and a chronic strain on administrative resources. Recent reports identify ongoing tensions and violent clashes in Nepal's prisons as direct outcomes of severe inmate congestion and inadequate supervision (The Kathmandu Post, 2023). These realities illustrate the need for more effective information systems that assist administrators in recordkeeping, monitoring trends, and enabling timely operational decisions.

Within this real-world context, the Prison Management System project has been developed as a comprehensive educational software application for the CS5005 Data Structures and Specialist Programming module. The principal aim of this project is to bridge the gap between abstract theoretical learning and its application in practical, complex scenarios. By situating data structure and algorithm (DSA) principles within the domain of prison information management, the project demonstrates how foundational computer science constructs can be utilized to solve dynamic data challenges effectively.

Prison environments inherently involve data that changes frequently, such as admissions, releases, transfers, and legal status updates. To support this dynamism, the system uses Linked Lists to store prisoner records, allowing efficient insertion and deletion operations without fixed size constraints. Queues implement tracking of recent administrative activities under the First-In-First-Out (FIFO) paradigm, reflecting realistic event ordering. Stacks are incorporated to facilitate undo operations according to Last-In-First-Out (LIFO) behavior, demonstrating practical recovery mechanisms.

Furthermore, the project employs both Linear Search (O(n)) and Binary Search (O(log n)) algorithms, enabling learners to contrast sequential and divide-and-conquer strategies within a real dataset context. Sorting operations demonstrate algorithmic complexity through organized arrangements based on multiple attributes such as ID, age, and admission date.

From a software engineering standpoint, the system embraces the Model-View-Controller (MVC) architectural pattern to ensure modularity, maintainability, and clarity. Data models encapsulate prisoner information, Java Swing interfaces present user interactions, and controller components manage validation and logic operations. This design adheres to single responsibility principles and reflects industry’s best practices for scalable software systems.

Although developed for academic purposes, the project also holds broader relevance to evolving prison management needs. Nepal’s prison system continues to grapple with structural challenges ranging from poorly maintained infrastructure to insufficient health services and case tracking mechanisms. A robust information system, even in prototype form, offers insights into how dynamic data handling, structured records, and algorithmic operations can contribute to more transparent and responsive administrative practices.

In summary, the Prison Management System serves a dual purpose; it is both a pedagogical tool that concretizes DSA concepts through realistic applications and a conceptual example of how software solutions can support complex institutional challenges. By aligning theoretical knowledge with disciplined software design, the project reinforces essential competencies in algorithmic thinking, architectural planning, and data-driven decision support bringing competencies critical for both academic assessment and future professional development.

1.2 Aim and Objectives

AIM

The aim of this project is to design and implement an educational Prison Management System that demonstrates the practical application of core Data Structures and Algorithms concepts in solving real-world data management problems within a realistic administrative context .

Objectives

- Apply fundamental data structures such as Linked Lists, Queues, and Stacks to model and manage dynamic prisoner records in a realistic administrative system.
- Design and implement a structured CRUD-based prisoner management system with comprehensive input validation to ensure accuracy, consistency, and data integrity.
- Analyze and Compare Linear Search and Binary Search algorithms by integrating them into the system to enable efficient retrieval of prisoner information.
- Organize and Optimize prisoner records using appropriate sorting techniques like Selection Sort, Insertion Sort and Merge Sortbased on multiple attributes to enhance data accessibility and operational efficiency.
- Develop and evaluate a user-friendly graphical interface with recovery mechanisms that minimize user error and support safe restoration of deleted records.

1.3 Problem Statement

Prison administration in developing countries such as Nepal faces persistent challenges due to outdated and inefficient record-management practices. Many prison facilities continue to rely on manual or semi-digital systems that are prone to human error, data inconsistency, and delayed information retrieval. These limitations are intensified by severe overcrowding, with Nepal's prisons operating significantly beyond their intended capacity, placing excessive strain on administrative processes (Kathmandu School of Law Review, 2022). Under such conditions, maintaining accurate prison records and accessing information promptly during legal proceedings, medical emergencies, or security incidents becomes increasingly difficult.

Existing systems also lack the flexibility required to manage highly dynamic prison data. Frequent admissions, releases, transfers, and status updates demand efficient data handling mechanisms; however, traditional systems often employ rigid data structures and inefficient search techniques. As a result, routine operations such as locating prison records or generating administrative summaries rely on sequential scanning, leading to performance degradation as data volume increases. Furthermore, many legacy systems are architecturally monolithic, combining data handling, logic, and presentation layers in tightly coupled designs. This lack of modularity limits maintainability, hinders scalability, and increases the likelihood of errors during system updates. Inadequate input validation further compromises data integrity, allowing inaccurate or incomplete information to propagate through administrative workflows.

Proposed System and Addressed Limitations

The proposed Prison Management System addresses these limitations through structured application of data structures, algorithms, and modular software architecture. Dynamic prisoner records are managed using Linked Lists, enabling efficient insertion and deletion operations that align with the continuously changing nature of prison populations. To improve data retrieval efficiency, the system incorporates both Linear Search and Binary Search algorithms, reducing search time for sorted datasets and improving operational responsiveness.

The adoption of the Model-View-Controller (MVC) architectural pattern ensures clear separation of concerns between data models, business logic, and user interface components. This modular design enhances maintainability, simplifies future enhancements, and supports independent testing. Additionally, comprehensive input validation mechanisms ensure data accuracy and consistency, while Queue and Stack implementations support activity tracking and undo functionality, improving usability and administrative transparency.

Overall, the proposed system demonstrates how disciplined software design and algorithmic efficiency can overcome the operational limitations of traditional prison management systems. It serves both as an effective educational implementation of data structure concepts and as a conceptually viable solution for improving administrative reliability in resource-constrained institutional environments.

2. MVC Architecture & ANT Setup

The Model-View-Controller (MVC) architecture is a software design pattern that separates an application into three interconnected components, promoting organized code structure, maintainable development, and scalability (Gamma, et al., 1994). In our Prison Management System, we have implemented this architecture to ensure clear separation of concerns and to support efficient data handling.

Architecture Overview

Model

The Model component represents the data and business logic layer. In our system, the PrisonerModel class encapsulates all prisoner-related data, including personal information (name, age, gender, address), crime details (type, description), sentence information (admission date, duration, release date), and status indicators (health status, incarceration status). This layer maintains data integrity and defines the structure of prisoner records, operating independently of the user interface to ensure consistent data logic regardless of presentation (Anon., n.d.).

View

The View component handles the presentation layer and user interface. Our system uses Java Swing components such as JTable, JOption (Anon., n.d.)Pane, and UI panels to display prisoner information, search results, and statistical data. The View renders data for users in a readable format and captures user inputs through forms and interactive elements. It communicates with the Controller to retrieve data for display but contains no business logic itself (GeeksforGeeks, 2023).

Controller

The Controller, exemplified by our PrisonController class, acts as an intermediary between the Model and View. It processes user requests, manipulates data through business logic operations (delegated to specialized classes like CRUD, SearchOperation, SortOperation, and TrashBinOperation), and updates the View accordingly. The controller manages data structures including a LinkedList for active prisoners, a Queue for recently added prisoners (demonstrating FIFO operations), and a Stack for deleted prisoners in the trash bin (demonstrating LIFO operations). It orchestrates complex operations like adding, updating, deleting, searching, and sorting prisoners while maintaining data consistency across collections (Gamma, et al., 1994).

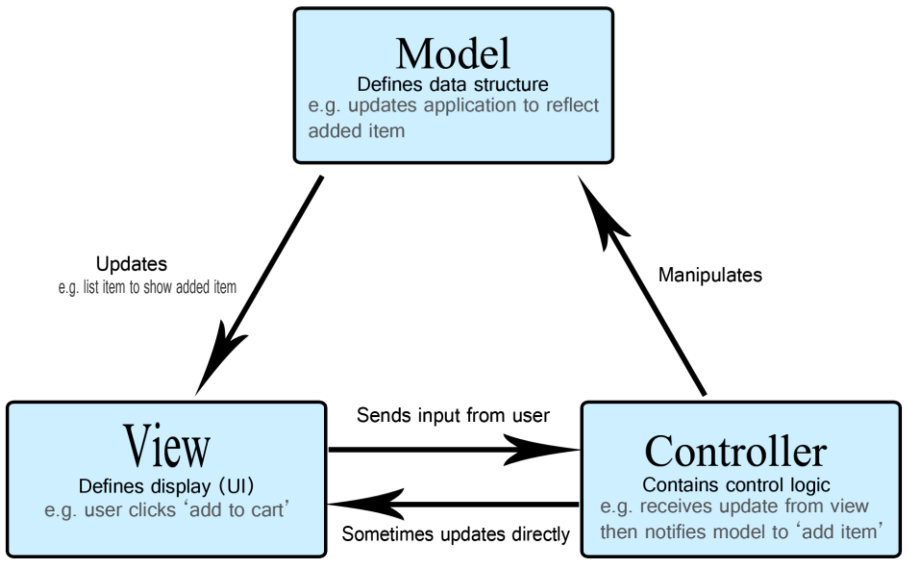
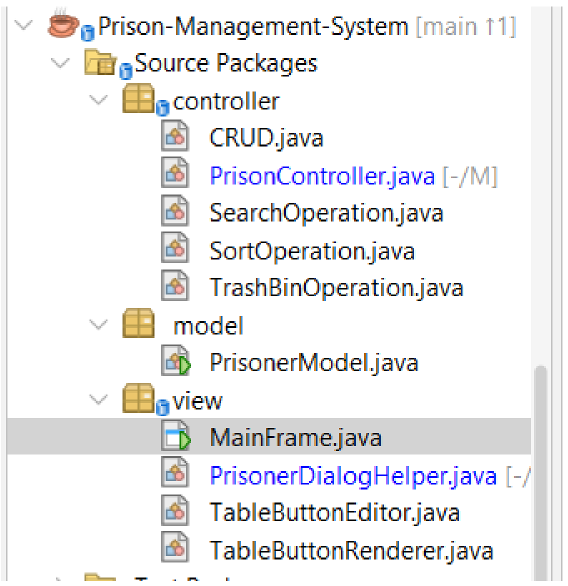

Model
Defines data structure
e.g. updates application to reflect added item
Updates
e.g. list item to show added item
Manipulates
View
Defines display (UI)
e.g. user clicks 'add to cart'
Sends input from user
Sometimes updates directly
Controller
Contains control logic
e.g. receives update from view then notifies model to 'add item'

Figure 1: MVC Architechture



Prison-Management-System [main ↑1]
Source Packages
controller
CRUD.java
PrisonController.java [-/M]
SearchOperation.java
SortOperation.java
TrashBinOperation.java
model
PrisonerModel.java
view
MainFrame.java
PrisonerDialogHelper.java [-/
TableButtonEditor.java
TableButtonRenderer.java

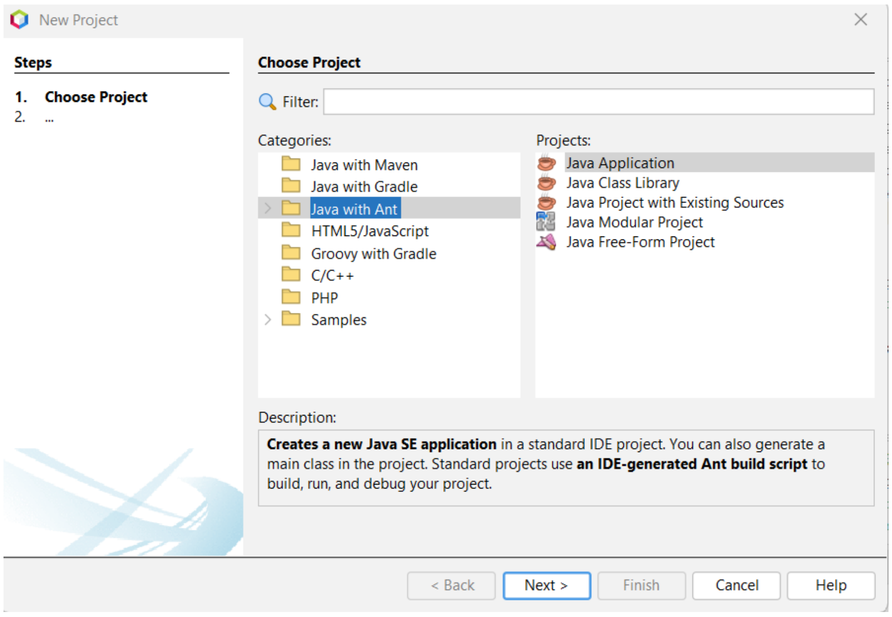
Figure 2: MVC Folder structure for Prison Management System

ANT SETUP

To compile and run the Prison Management System efficiently, the project uses Apache Ant, a Java-based build tool that automates compilation, packaging, and execution tasks. Ant allows developers to:

1. Automate Compilation: Compile all Java classes in the correct order, handling dependencies automatically.
2. Package Applications: Bundle compiled classes and resources into JAR files for easier distribution.
3. Manage Tasks: Clean previous builds, run tests, and execute the main program with predefined targets.

Using Ant streamlines project setup, reduces human errors during manual compilation, and ensures consistent builds across development environments. For academic submissions, it also demonstrates good software engineering practices by separating code, resources, and build logic (Apache Ant Project, n.d.).


New Project

Steps
1. Choose Project
2. ...

Choose Project
Filter:

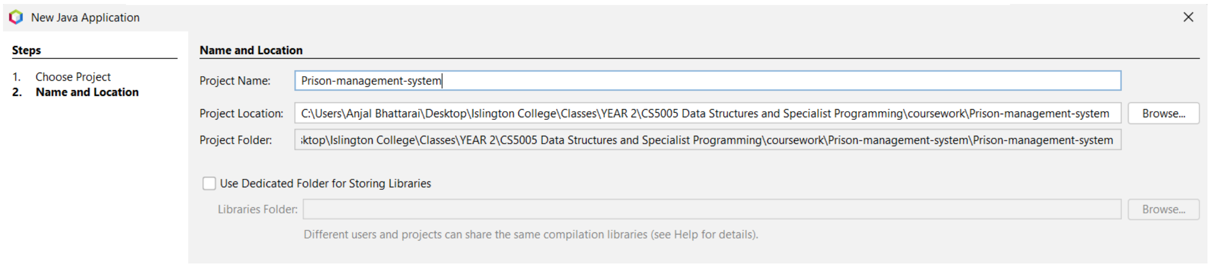
Categories:
- Java with Maven
- Java with Gradle
- Java with Ant
- HTML5/JavaScript
- Groovy with Gradle
- C/C++
- PHP
- Samples

Projects:
- Java Application
- Java Class Library
- Java Project with Existing Sources
- Java Modular Project
- Java Free-Form Project

Description:
Creates a new Java SE application in a standard IDE project. You can also generate a main class in the project. Standard projects use **an IDE-generated Ant build script** to build, run, and debug your project.

< Back | Next > | Finish | Cancel | Help

Figure 3: Ant Setup (1)


New Java Application

Steps
1. Choose Project
2. Name and Location

Name and Location
Project Name: Prison-management-system
Project Location: C:\Users\Anjal Bhattarai\Desktop\Islington College\Classes\YEAR 2\CS5005 Data Structures and Specialist Programming\coursework\Prison-management-system | Browse...
Project Folder: ;ktop\Islington College\Classes\YEAR 2\CS5005 Data Structures and Specialist Programming\coursework\Prison-management-system\Prison-management-system

☐ Use Dedicated Folder for Storing Libraries
Libraries Folder: | Browse...
Different users and projects can share the same compilation libraries (see Help for details).

Figure 4: Ant Setup (2)

3. Class Diagrams

A class diagram is a structural diagram in the Unified Modeling Language (UML) that provides a static view of a system's architecture by illustrating the system's classes, their attributes, methods, and the relationships between objects. It serves as the backbone of object-oriented modeling and design, depicting how different classes interact with each other through associations, dependencies, aggregations, and compositions. Class diagrams are essential for visualizing the overall structure of a software system and act as a blueprint during development and maintenance (IBM, 2021).

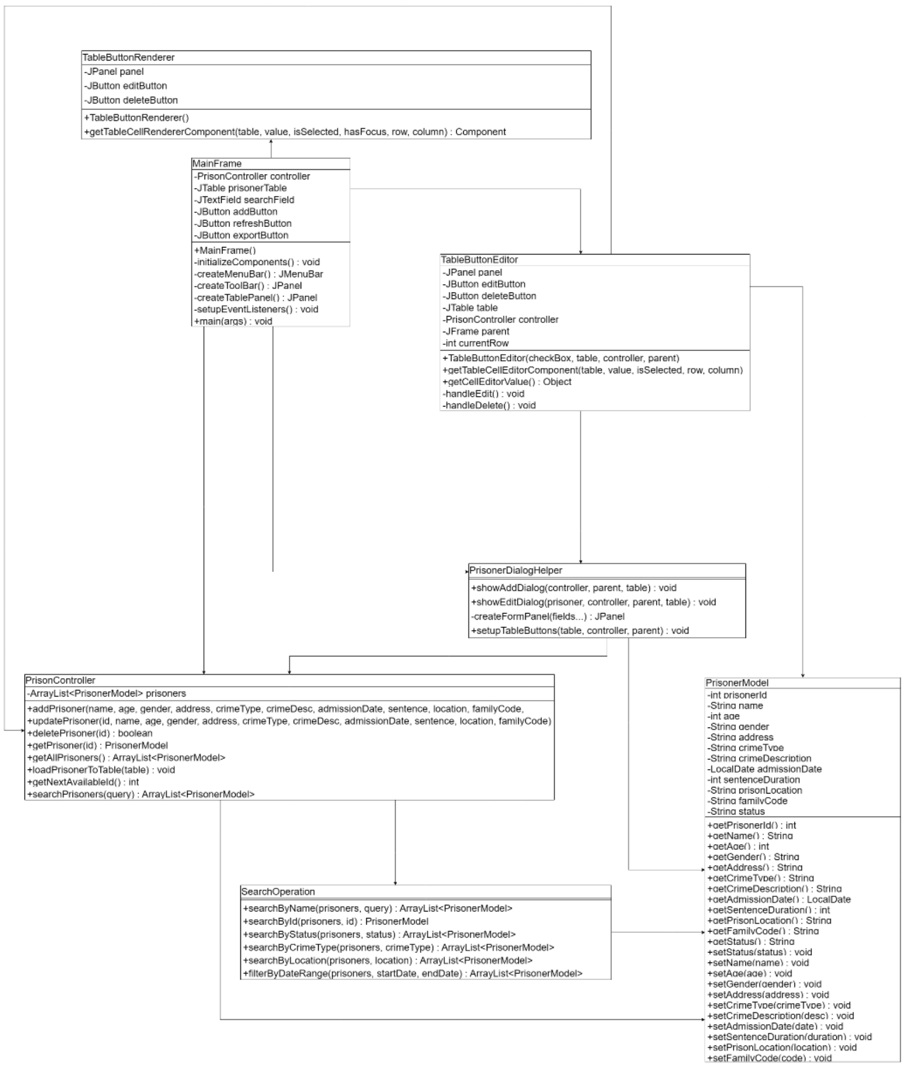

TableButtonRenderer
-JPanel panel
-JButton editButton
-JButton deleteButton
+TableButtonRenderer()
+getTableCellRendererComponent(table, value, isSelected, hasFocus, row, column) : Component
MainFrame
-PrisonController controller
-JTable prisonerTable
-JTextField searchField
-JButton addButton
-JButton refreshButton
-JButton exportButton
+MainFrame()
-initializeComponents() : void
-createMenuBar() : JMenuBar
-createToolBar() : JPanel
-createTablePanel() : JPanel
-setupEventListeners() : void
+main(args) : void
TableButtonEditor
-JPanel panel
-JButton editButton
-JButton deleteButton
-JTable table
-PrisonController controller
-JFrame parent
-int currentRow
+TableButtonEditor(checkBox, table, controller, parent)
+getTableCellEditorComponent(table, value, isSelected, row, column)
+getCellEditorValue() : Object
-handleEdit() : void
-handleDelete() : void
PrisonerDialogHelper
+showAddDialog(controller, parent, table) : void
+showEditDialog(prisoner, controller, parent, table) : void
-createFormPanel(fields...) : JPanel
+setupTableButtons(table, controller, parent) : void
PrisonController
-ArrayList<PrisonerModel> prisoners
+addPrisoner(name, age, gender, address, crimeType, crimeDesc, admissionDate, sentence, location, familyCode,
+updatePrisoner(id, name, age, gender, address, crimeType, crimeDesc, admissionDate, sentence, location, familyCode)
+deletePrisoner(id) : boolean
+getPrisoner(id) : PrisonerModel
+getAllPrisoners() : ArrayList<PrisonerModel>
+loadPrisonerToTable(table) : void
+getNextAvailableId() : int
+searchPrisoners(query) : ArrayList<PrisonerModel>
PrisonerModel
-int prisonerId
-String name
-int age
-String gender
-String address
-String crimeType
-String crimeDescription
-LocalDate admissionDate
-int sentenceDuration
-String prisonLocation
-String familyCode
-String status
+getPrisonerId() : int
+getName() : String
+getAge() : int
+getGender() : String
+getAddress() : String
+getCrimeType() : String
+getCrimeDescription() : String
+getAdmissionDate() : LocalDate
+getSentenceDuration() : int
+getPrisonLocation() : String
+getFamilyCode() : String
+getStatus() : String
+setStatus(status) : void
+setName(name) : void
+setAge(age) : void
+setGender(gender) : void
+setAddress(address) : void
+setCrimeType(crimeType) : void
+setCrimeDescription(desc) : void
+setAdmissionDate(date) : void
+setSentenceDuration(duration) : void
+setPrisonLocation(location) : void
+setFamilyCode(code) : void
SearchOperation
+searchByName(prisoners, query) : ArrayList<PrisonerModel>
+searchById(prisoners, id) : PrisonerModel
+searchByStatus(prisoners, status) : ArrayList<PrisonerModel>
+searchByCrimeType(prisoners, crimeType) : ArrayList<PrisonerModel>
+searchByLocation(prisoners, location) : ArrayList<PrisonerModel>
+filterByDateRange(prisoners, startDate, endDate) : ArrayList<PrisonerModel>

Figure 5: Class diagram

In our Prison Management System, the class diagram illustrates a well-structured MVC (Model-View-Controller) architecture consisting of seven primary classes working cohesively to manage prisoner data. The PrisonerModel class serves as the data entity, encapsulating all prisoner-related attributes such as ID, name, age, crime details, and status. The PrisonController class acts as the business logic layer, managing an ArrayList of PrisonerModel objects and providing methods for CRUD operations (Create, Read, Update, Delete) and search functionality. The view layer comprises MainFrame as the primary user interface, PrisonerDialogHelper for handling add and edit dialogs with comprehensive input validation, and TableButtonRenderer and TableButtonEditor for rendering and managing action buttons within the prisoner table. Additionally, the SearchOperation class provides advanced search and filtering capabilities. The relationships demonstrate a clear separation of concerns where MainFrame depends on PrisonController for data operations, utilizes PrisonerDialogHelper for dialog management, and employs custom table components for interactive functionality, ensuring a maintainable and scalable codebase that follows object-oriented design principles.

4. Wireframe Design and User Interface Screens

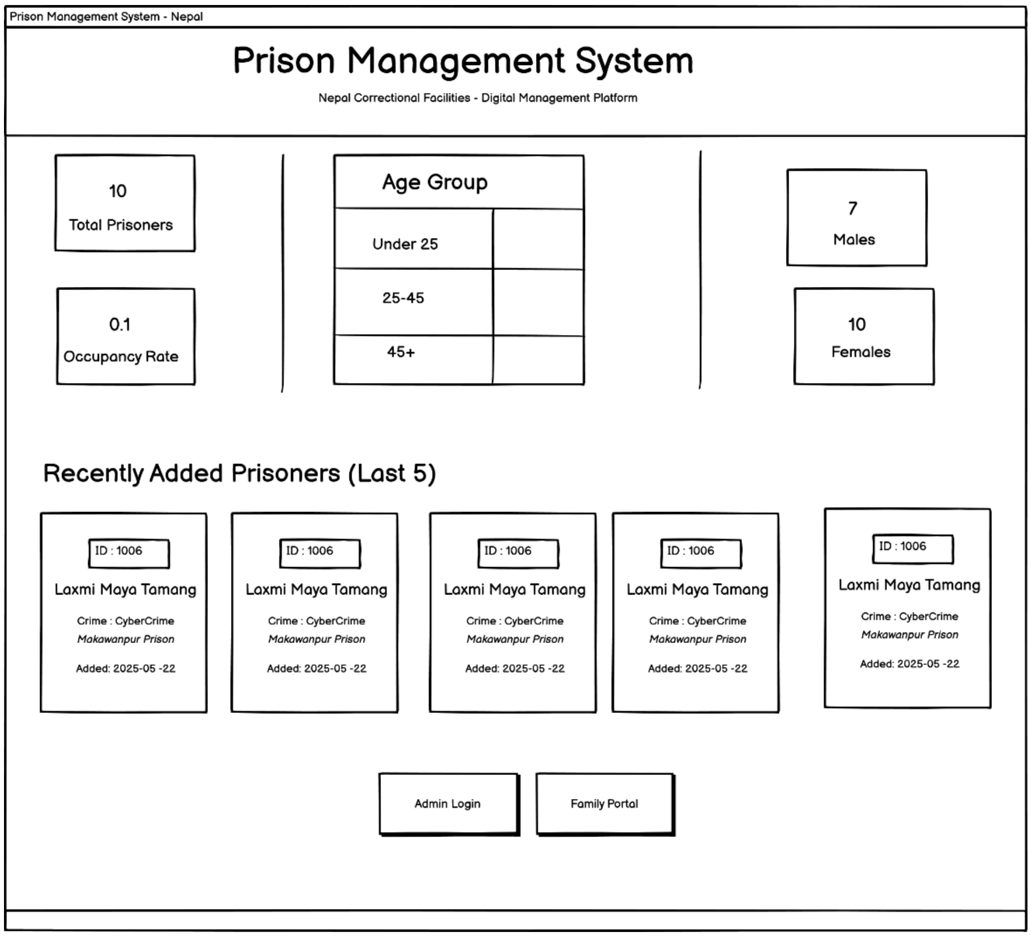


Figure 6: Wireframe of Home page

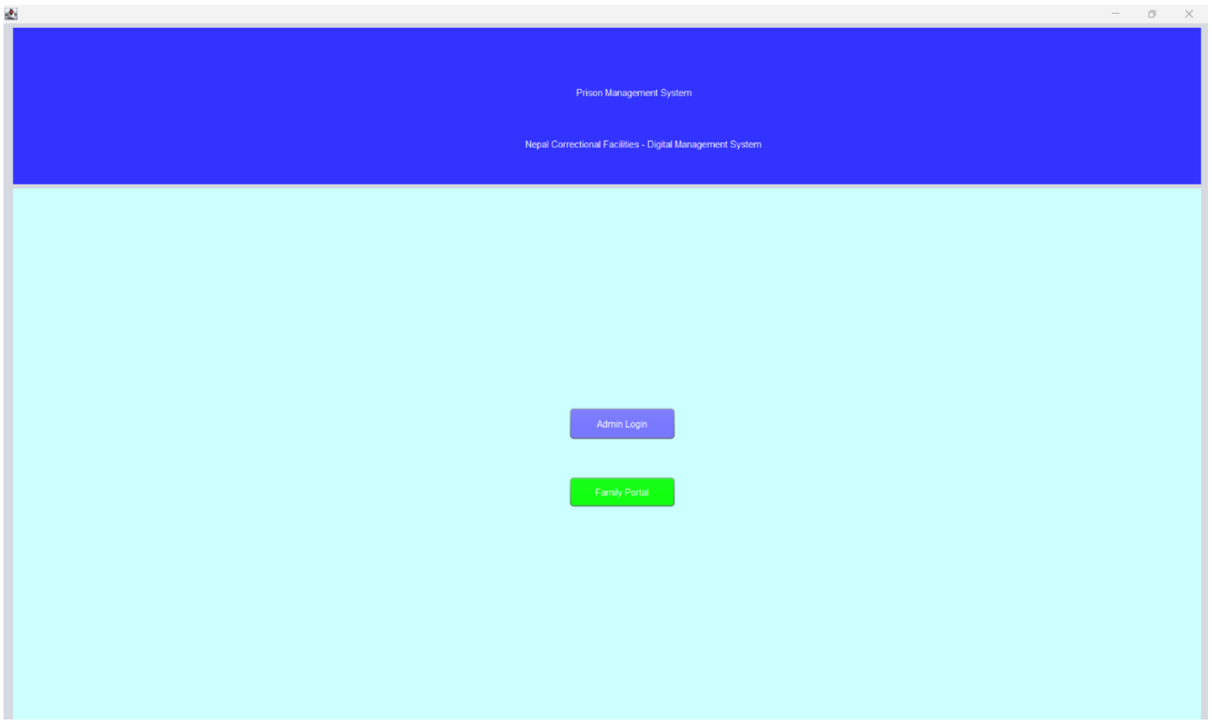


Figure 7: Actual Home page

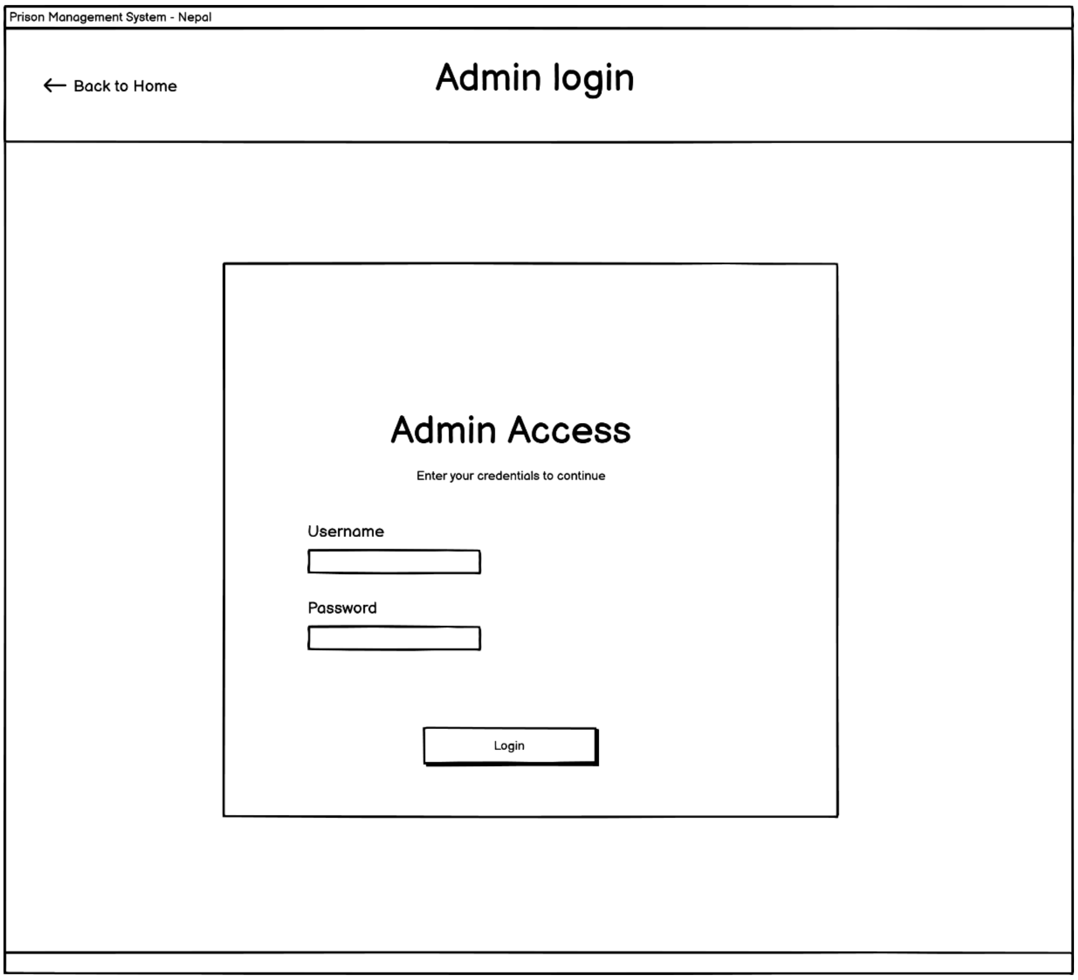

Prison Management System - Nepal
← Back to Home
Admin login
Admin Access
Enter your credentials to continue
Username
Password
Login

Figure 8: Wireframe of Admin Login page

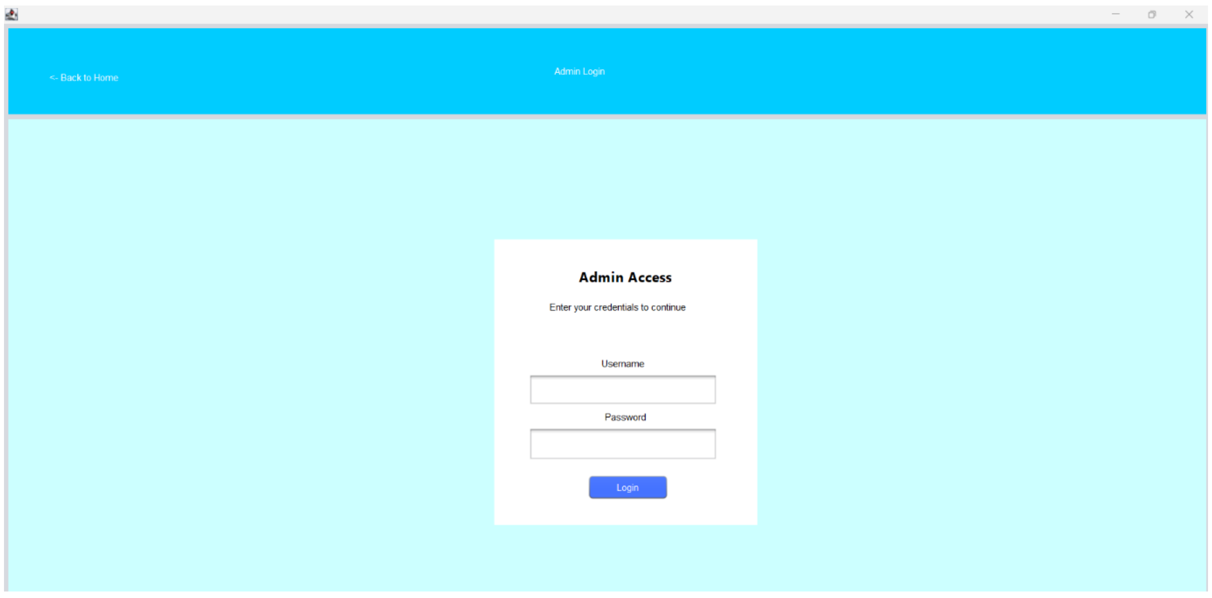


Figure 9: Actual Admin login page

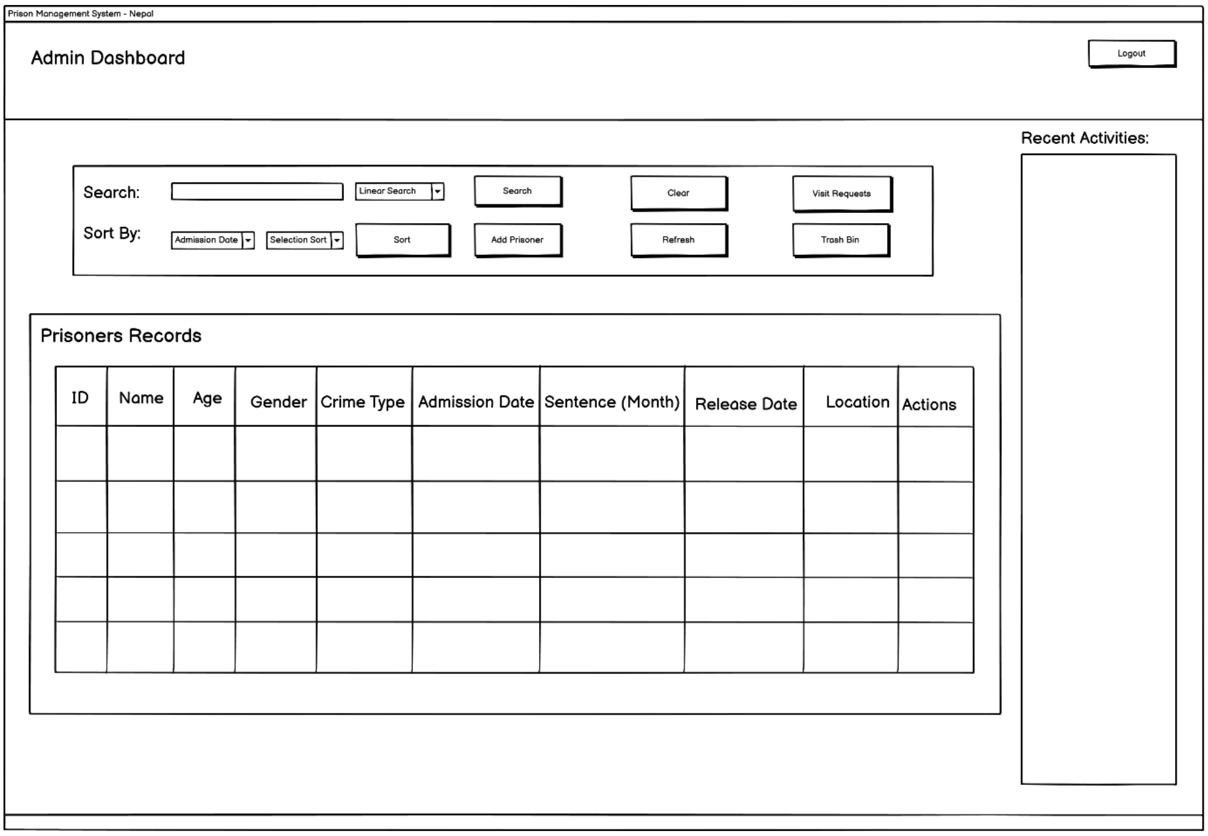
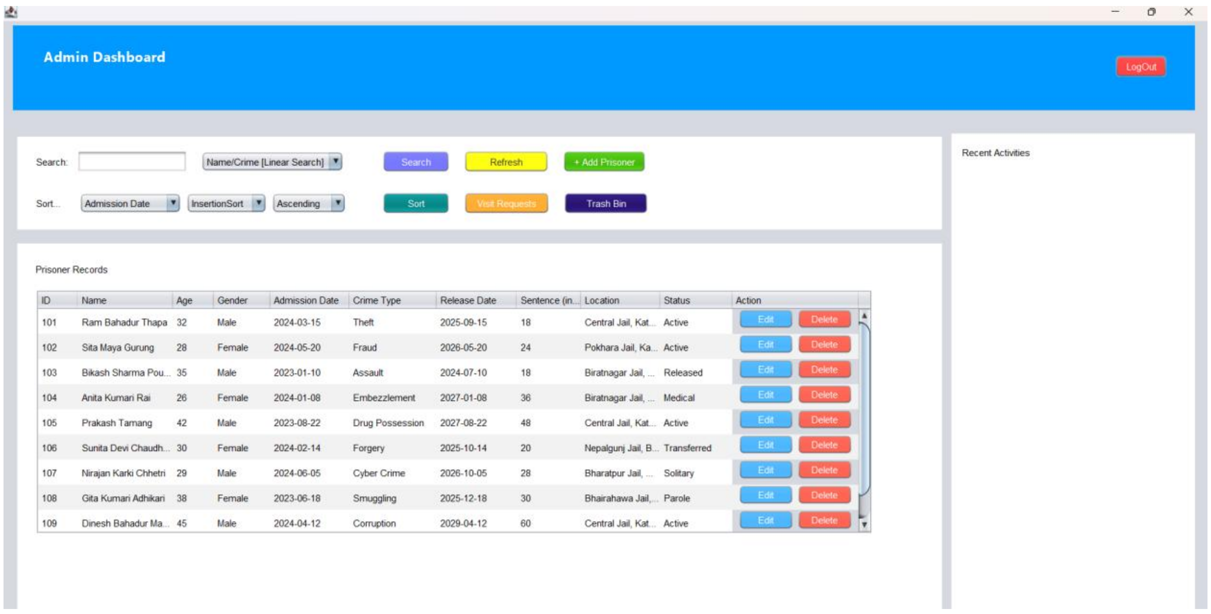


Figure 10: Wireframe of Admin Dashboard



Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in...	Location	Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2025-09-15	18	Central Jail, Kat...	Active	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2026-05-20	24	Pokhara Jail, Ka...	Active	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2024-07-10	18	Biratnagar Jail, ...	Released	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2027-01-08	36	Biratnagar Jail, ...	Medical	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08-22	48	Central Jail, Kat...	Active	Edit Delete
106	Sunita Devi Chaudh...	30	Female	2024-02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, ...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail,...	Parole	Edit Delete
109	Dinesh Bahadur Ma...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kat...	Active	Edit Delete

Figure 11: Actual Admin Login Dashboard

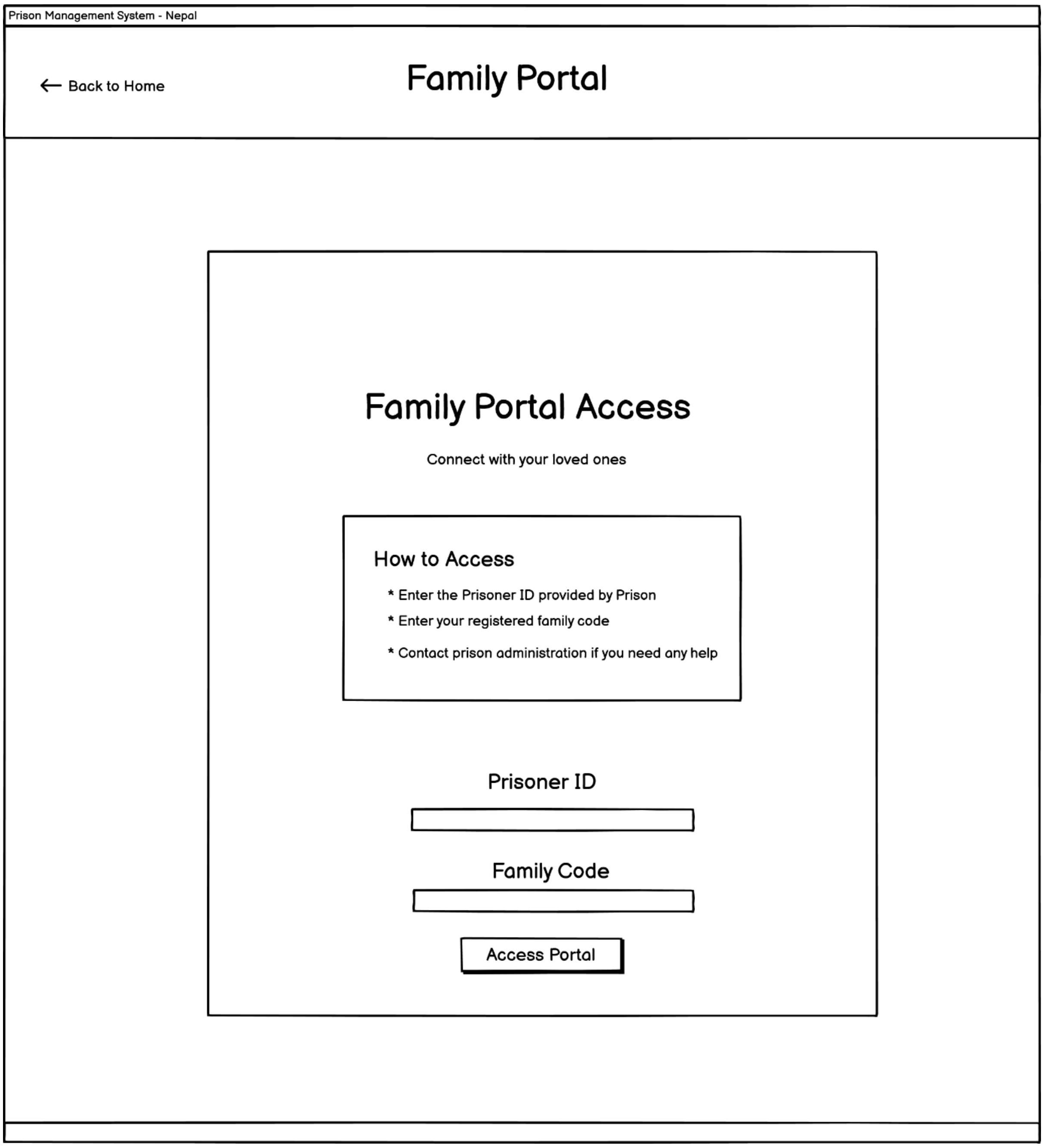

Prison Management System - Nepal
← Back to Home
Family Portal
Family Portal Access
Connect with your loved ones
How to Access
* Enter the Prisoner ID provided by Prison
* Enter your registered family code
* Contact prison administration if you need any help
Prisoner ID
Family Code
Access Portal

Figure 12: Wireframe of Family login portal

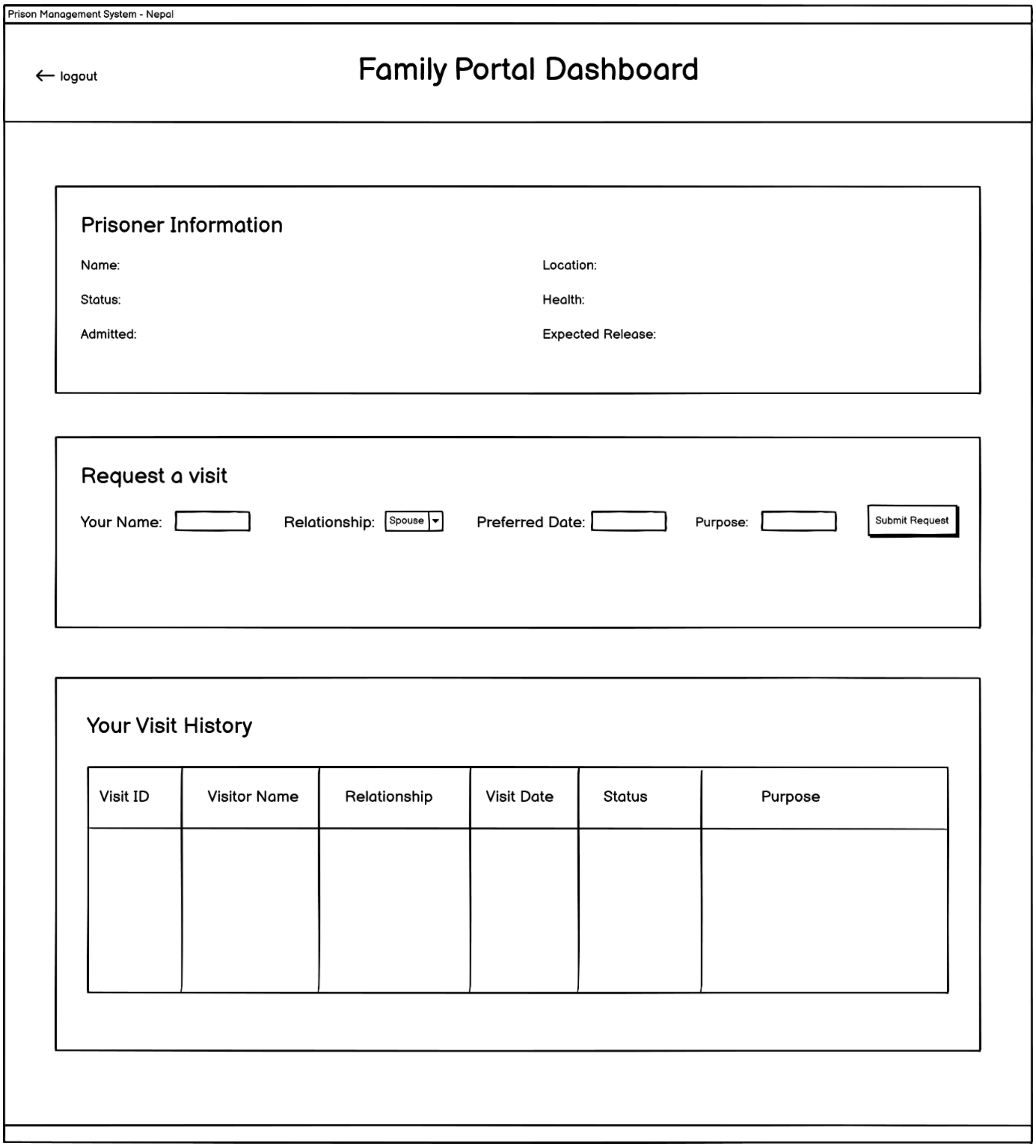
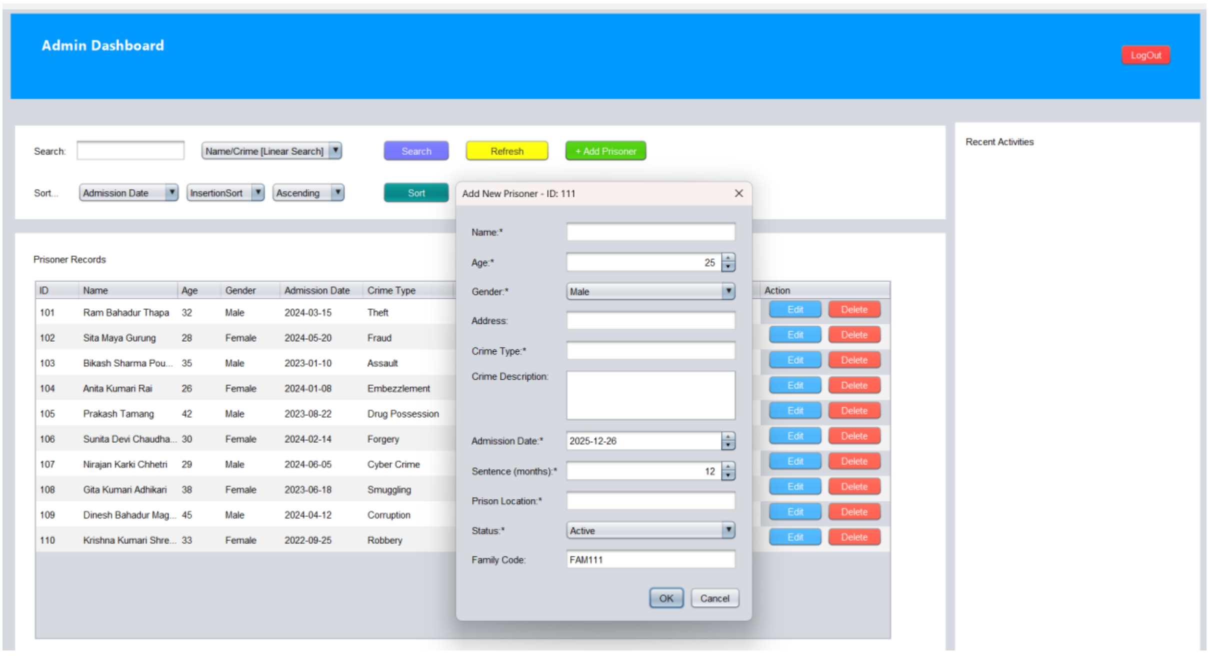


Figure 13: Wireframe of Family Dashboardp

5. CRUD Functionality

5.1 Create Functionality

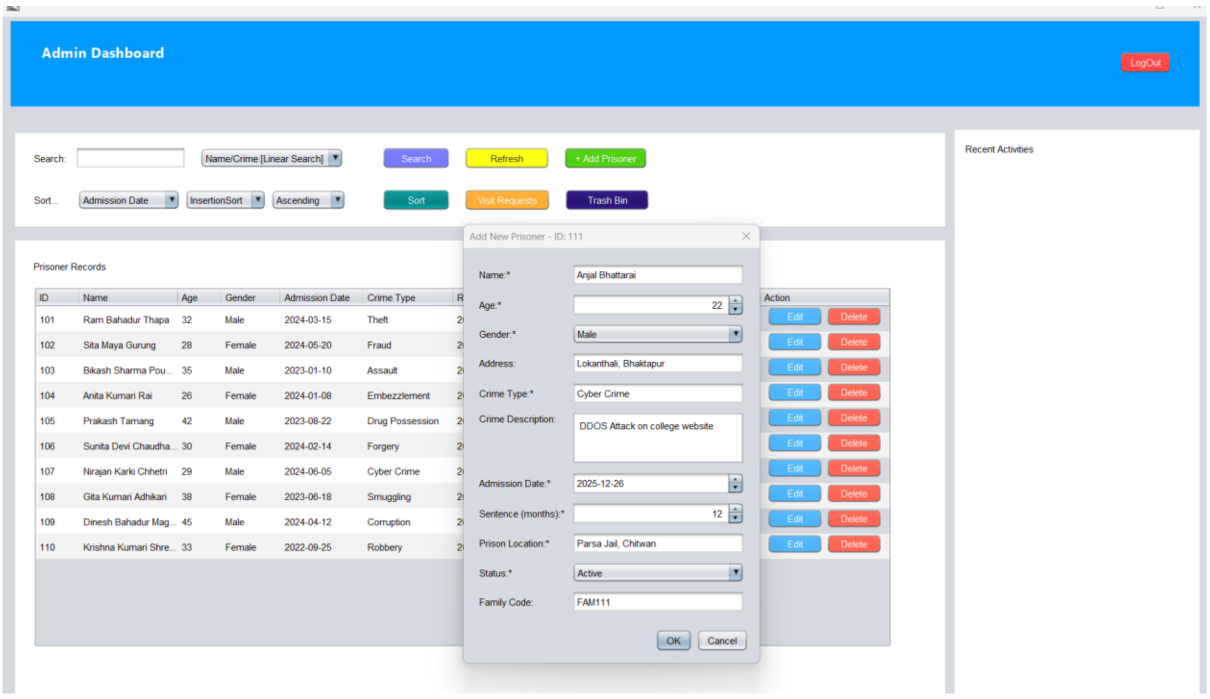


ID	Name	Age	Gender	Admission Date	Crime Type	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	Edit Delete

Add New Prisoner - ID: 111

Name:*	
Age:*	25
Gender:*	Male
Address:	
Crime Type:*	
Crime Description:	
Admission Date:*	2025-12-26
Sentence (months):*	12
Prison Location:*	
Status:*	Active
Family Code:	FAM111

Figure 14: Dialog Box to provide new prisoner detials

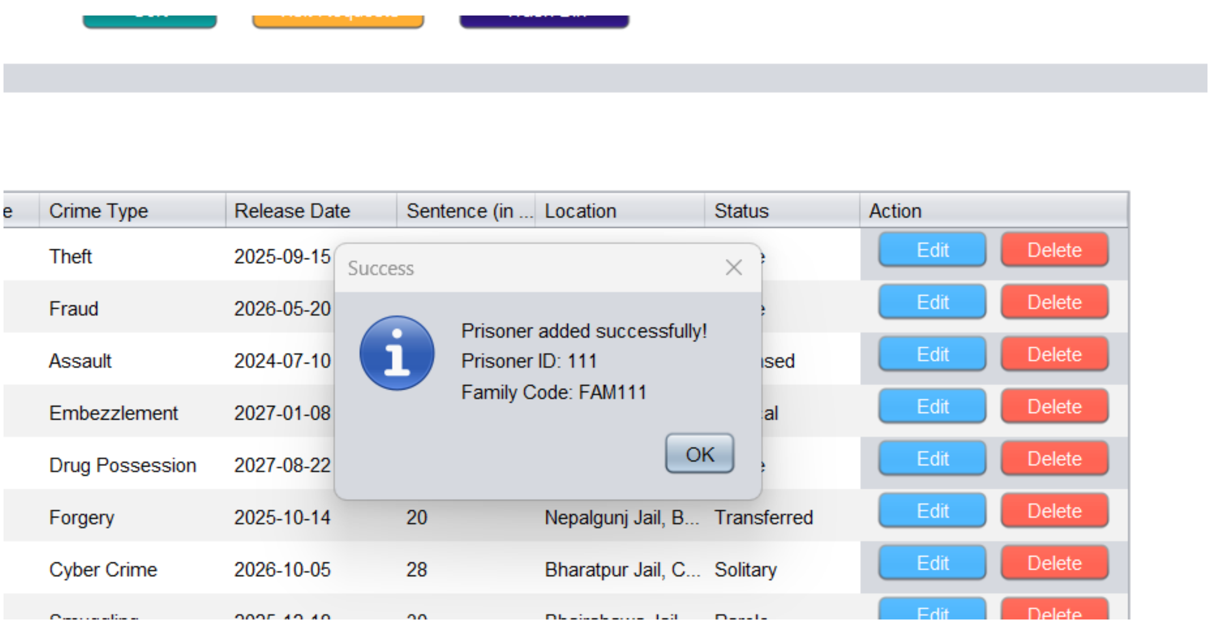


ID	Name	Age	Gender	Admission Date	Crime Type	R	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	2	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2	Edit Delete

Add New Prisoner - ID: 111

Name:*	Anjal Bhattarai
Age:*	22
Gender:*	Male
Address:	Lokanthali, Bhaktapur
Crime Type:*	Cyber Crime
Crime Description:	DDOS Attack on college website
Admission Date:*	2025-12-26
Sentence (months):*	12
Prison Location:*	Parsa Jail, Chitwan
Status:*	Active
Family Code:	FAM111

Figure 15: New Prisoner being added



Success

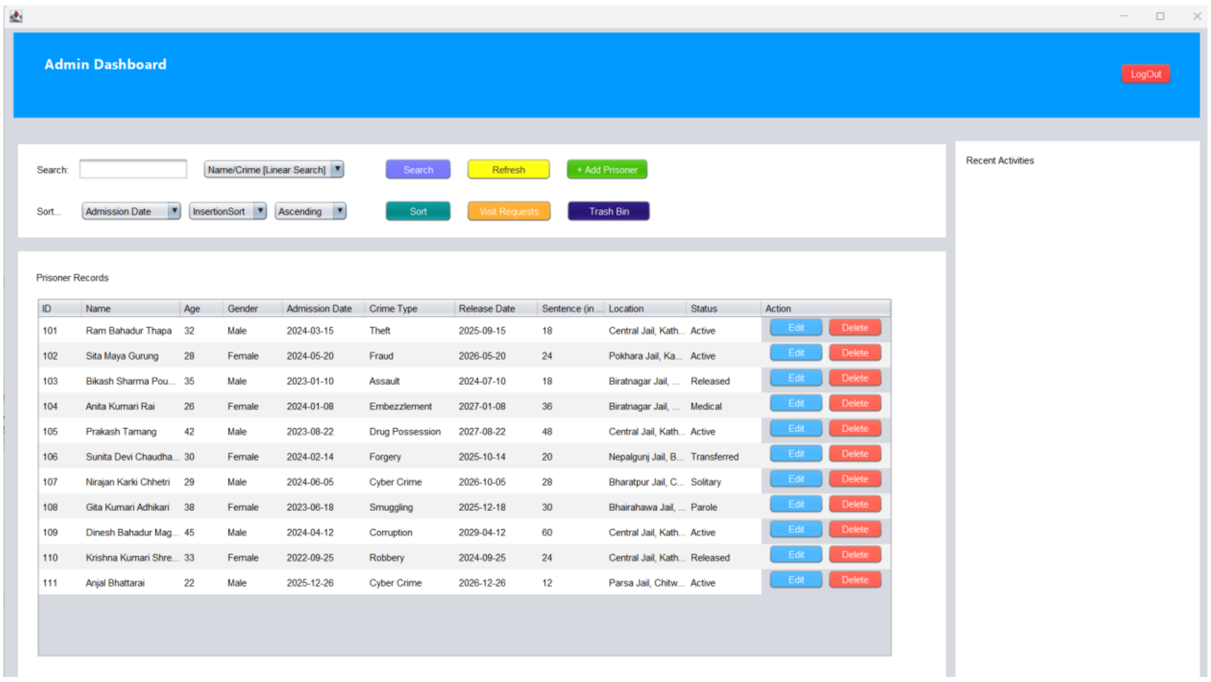
Prisoner added successfully!
Prisoner ID: 111
Family Code: FAM111

OK

e	Crime Type	Release Date	Sentence (in ...	Location	Status	Action
	Theft	2025-09-15			e	Edit Delete
	Fraud	2026-05-20			e	Edit Delete
	Assault	2024-07-10			ised	Edit Delete
	Embezzlement	2027-01-08			al	Edit Delete
	Drug Possession	2027-08-22			e	Edit Delete
	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete
	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete

Figure 16: Create new Prisoner Successfully

5.2 Read Functionality



Admin Dashboard

LogOut

Search: Name/Crime [Linear Search] Search Refresh + Add Prisoner

Sort... Admission Date InsertionSort Ascending Sort Visit Requests Trash Bin

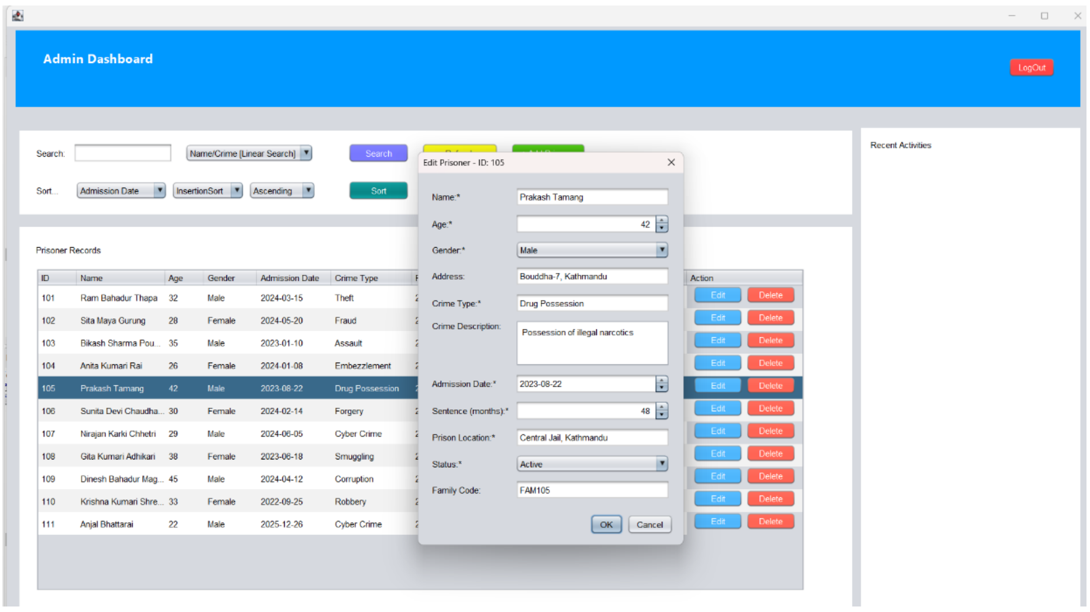
Recent Activities

Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in ...	Location	Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2025-09-15	18	Central Jail, Kath...	Active	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2026-05-20	24	Pokhara Jail, Ka...	Active	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2024-07-10	18	Biratnagar Jail, ...	Released	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2027-01-08	36	Biratnagar Jail, ...	Medical	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08-22	48	Central Jail, Kath...	Active	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime	2026-12-26	12	Parsa Jail, Chitw...	Active	Edit Delete

Figure 17: Detail over view of all Prisoner

5.3 Update Functionality



Prisoner Records

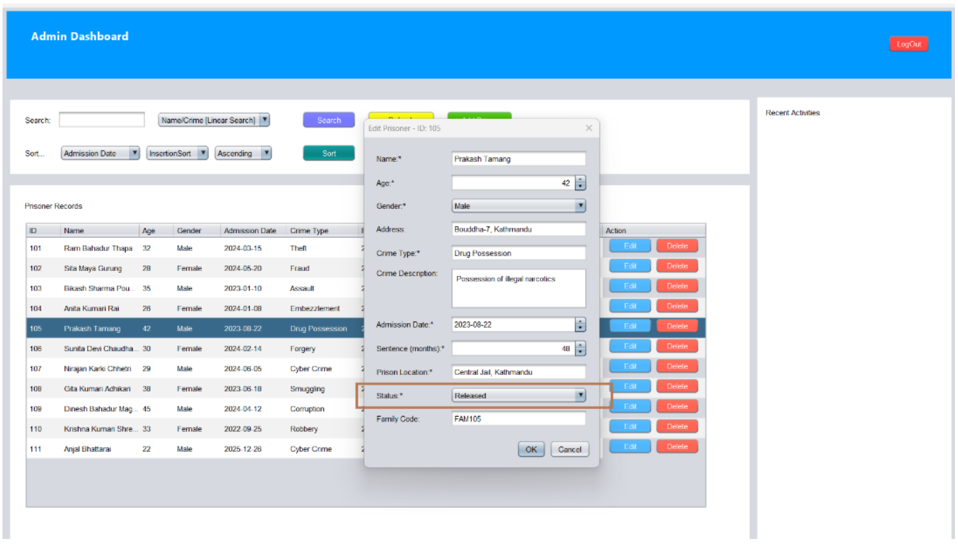
ID	Name	Age	Gender	Admission Date	Crime Type
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime

Edit Prisoner - ID: 105

Name:*	Prakash Tamang
Age:*	42
Gender:*	Male
Address:	Bouddha-7, Kathmandu
Crime Type:*	Drug Possession
Crime Description:	Possession of illegal narcotics
Admission Date:*	2023-08-22
Sentence (months):*	48
Prison Location:*	Central Jail, Kathmandu
Status:*	Active
Family Code:	FAM105

OK Cancel

Figure 18: Editable current details of prisoner when clicked edit button



Prisoner Records

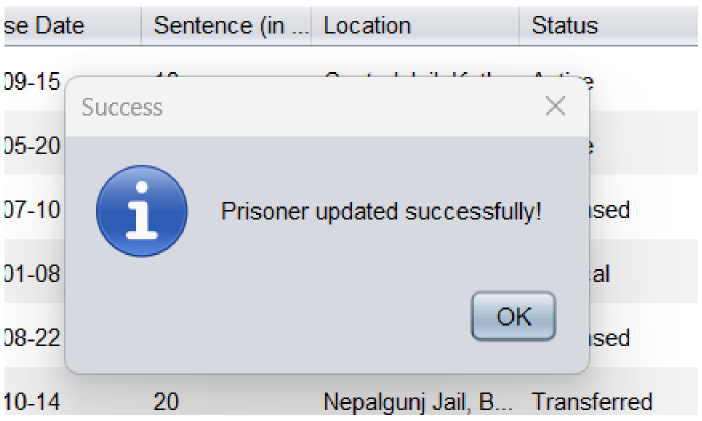
ID	Name	Age	Gender	Admission Date	Crime Type
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime

Edit Prisoner - ID: 105

Name:*	Prakash Tamang
Age:*	42
Gender:*	Male
Address:	Bouddha-7, Kathmandu
Crime Type:*	Drug Possession
Crime Description:	Possession of illegal narcotics
Admission Date:*	2023-08-22
Sentence (months):*	48
Prison Location:*	Central Jail, Kathmandu
Status:*	Released
Family Code:	FAM105

OK Cancel

Figure 19: Status changed from active to released

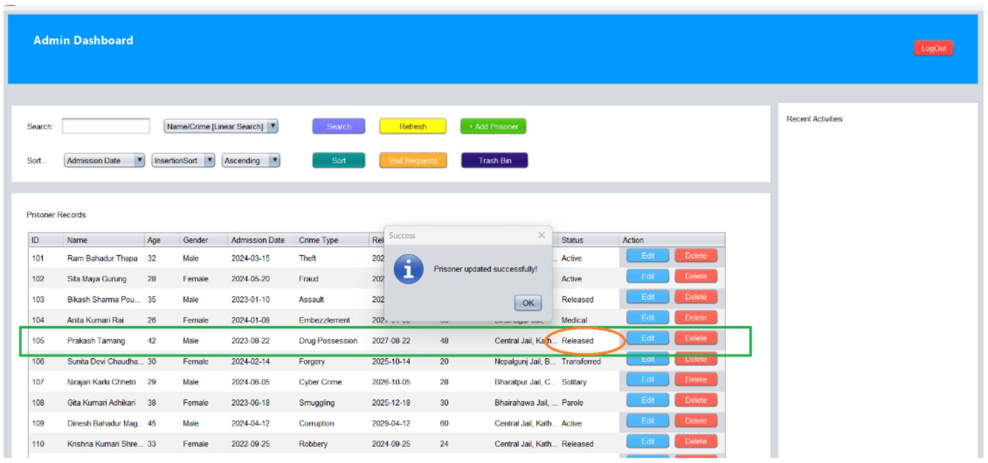


se Date	Sentence (in ...	Location	Status
09-15			
05-20			
07-10			sed
01-08			al
08-22			sed
10-14	20	Nepalgunj Jail, B...	Transferred

Success

Prisoner updated successfully!

OK



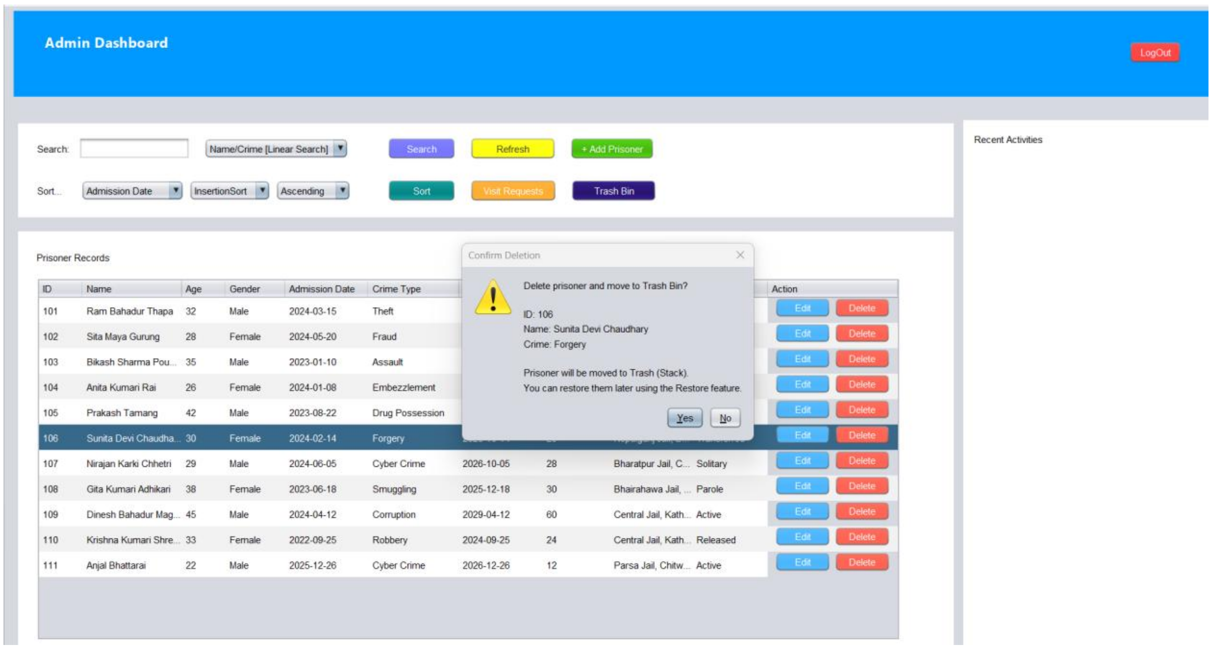
Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Rel			Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	202		...	Active	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	202		...	Active	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	202			Released	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	202			Medical	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08-22	48	Central Jail, Kath...	Released	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete

Prisoner updated successfully!

Figure 20: Updated details of prisoners

5.4 Delete Functionality



Confirm Deletion

Delete prisoner and move to Trash Bin?

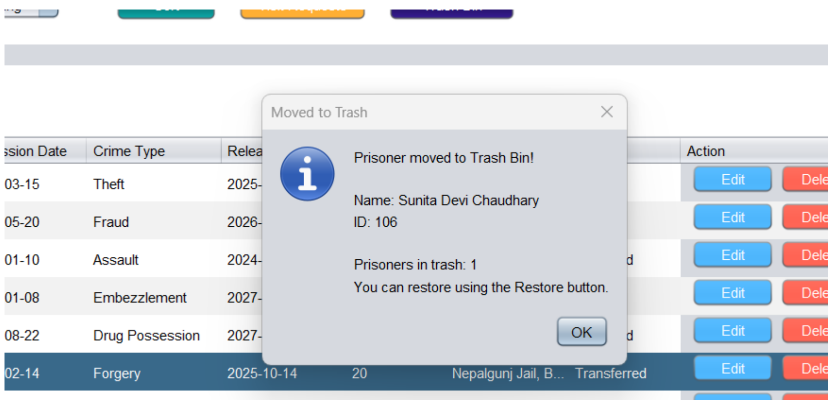
ID: 106
Name: Sunita Devi Chaudhary
Crime: Forgery

Prisoner will be moved to Trash (Stack).
You can restore them later using the Restore feature.

Yes No

ID	Name	Age	Gender	Admission Date	Crime Type					Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft					Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud					Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault					Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement					Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession					Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery					Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime	2026-12-26	12	Parsa Jail, Chitw...	Active	Edit Delete

Figure 21: DIalog Box to confirm deletion of prisoner details


Moved to Trash

Prisoner moved to Trash Bin!

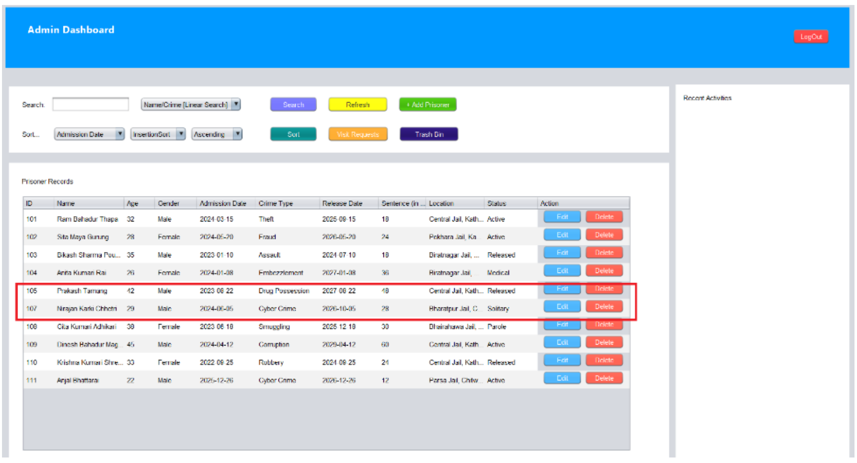
Name: Sunita Devi Chaudhary
ID: 106

Prisoners in trash: 1
You can restore using the Restore button.

OK

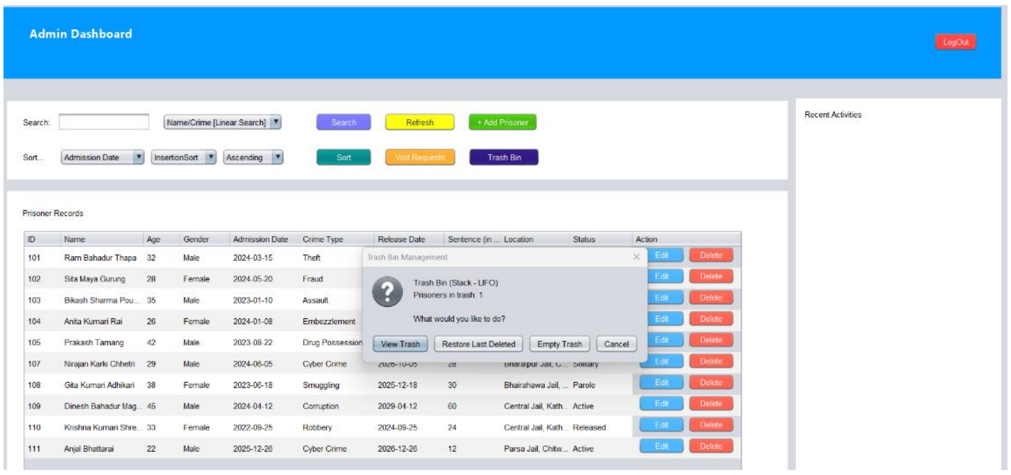
ssion Date	Crime Type	Relea				Action
03-15	Theft	2025-				Edit Dele
05-20	Fraud	2026-				Edit Dele
01-10	Assault	2024-			d	Edit Dele
01-08	Embezzlement	2027-				Edit Dele
08-22	Drug Possession	2027-			d	Edit Dele
02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Dele

Figure 22: Deletion Confirmation Pop-up



ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in ...	Location	Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2025-09-15	18	Central Jail, Kath...	Active	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2026-05-20	24	Pokhara Jail, Ka...	Active	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2024-07-10	18	Biratnagar Jail, ...	Released	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2027-01-08	36	Biratnagar Jail, ...	Medical	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08-22	48	Central Jail, Kath...	Released	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime	2026-12-26	12	Parsa Jail, Chitw...	Active	Edit Delete

Figure 23: Prisoner with id 106 deleted



Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in ...	Location	Status
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft				
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud				
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault				
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement				
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession				
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime	2026-12-26	12	Parsa Jail, Chitw...	Active

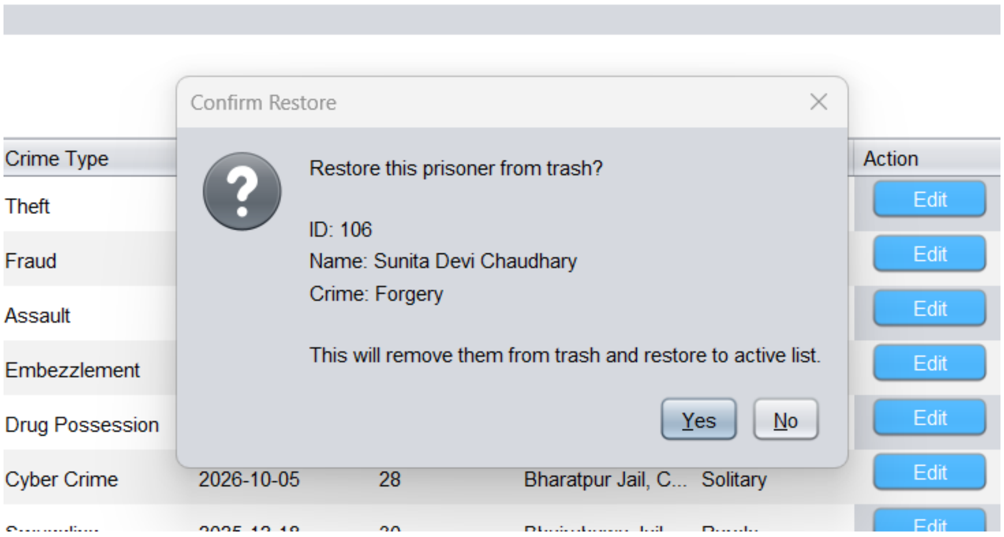
Trash Bin Management

Trash Bin (Stack - LIFO)
Prisoners in trash: 1

What would you like to do?

View Trash | Restore Last Deleted | Empty Trash | Cancel

Figure 24: Recently deleted prisoner stored in STACK



Confirm Restore

Restore this prisoner from trash?

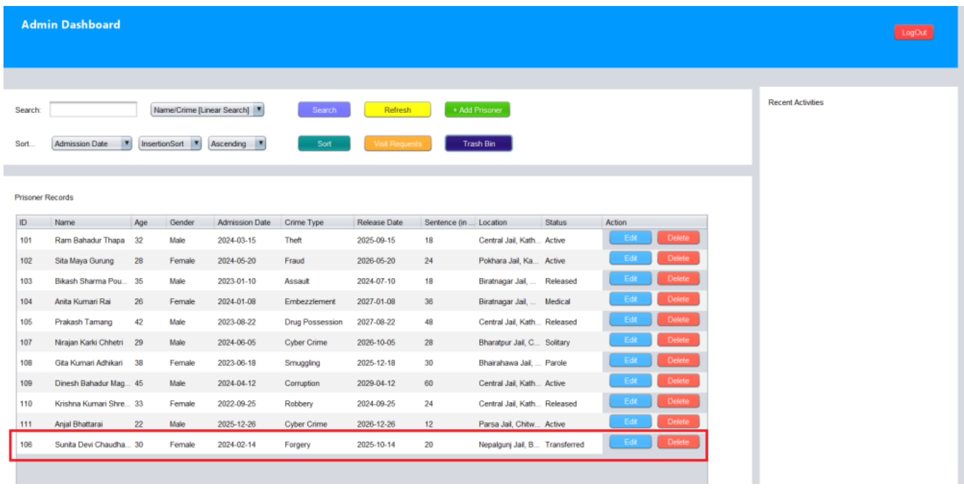
ID: 106
Name: Sunita Devi Chaudhary
Crime: Forgery

This will remove them from trash and restore to active list.

Yes | No

Crime Type						Action
Theft						Edit
Fraud						Edit
Assault						Edit
Embezzlement						Edit
Drug Possession						Edit
Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary		Edit

Figure 25: Restore Confirmation



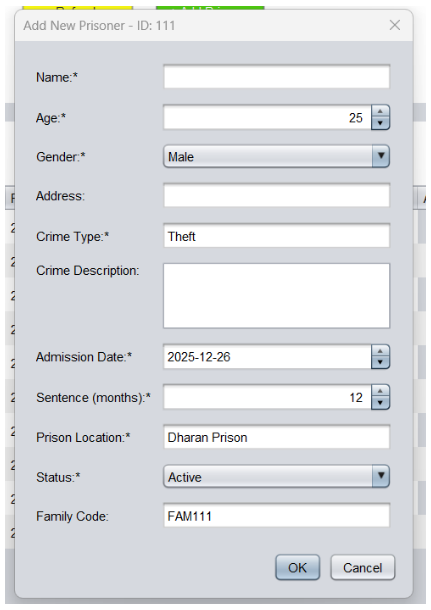
Prisoner Records

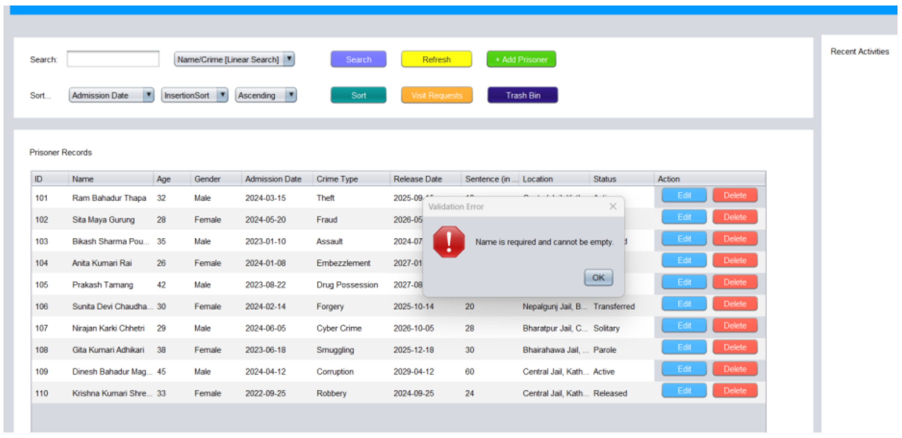
ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in ...	Location	Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2025-09-15	18	Central Jail, Kath...	Active	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2026-05-20	24	Pokhara Jail, Ka...	Active	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2024-07-10	18	Biratnagar Jail, ...	Released	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2027-01-08	36	Biratnagar Jail, ...	Medical	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08-22	48	Central Jail, Kath...	Released	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete
111	Anjal Bhattarai	22	Male	2025-12-26	Cyber Crime	2026-12-26	12	Parsa Jail, Chitw...	Active	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete

Figure 26: Restored Deleted Prisoner and Stored back in QUEUE

6. Test Cases

Test Case 01 : TC_CREATE_PRISONER_EMPTY_NAME_VALIDATION

Field	**Details**
Test Case	01
Test Description	Validation: Create Prisoner with Empty Name Field
Activity	Input: Click "Add Prisoner" button, Name: "" (empty string), Age: 25, Gender: "Male", Crime: "Theft", Admission Date: "2025-12-26", Sentence Duration: 12 months, Location: "Dharan Prison", Status: "Active"
Expected Output	System should reject the entry and display error message: "Name is required and cannot be empty." No prisoner record should be added to the LinkedList. Table should remain unchanged.
Actual Output	System rejected the entry and displayed error message: "Name is required and cannot be empty." No prisoner record was added to the LinkedList. Table remained unchanged.
Evidence	 Add New Prisoner - ID: 111 Name:* Age:* 25 Gender:* Male Address: Crime Type:* Theft Crime Description: Admission Date:* 2025-12-26 Sentence (months):* 12 Prison Location:* Dharan Prison Status:* Active Family Code: FAM111 *Figure 27: Add new prisoner with empty name*

Field	**Details**
	 *Figure 28: Empty name error message displayed*
Remarks	Test Successful.

Search: Name/Crime [Linear Search]

Sort... Admission Date InsertionSort Ascending

Recent Activities

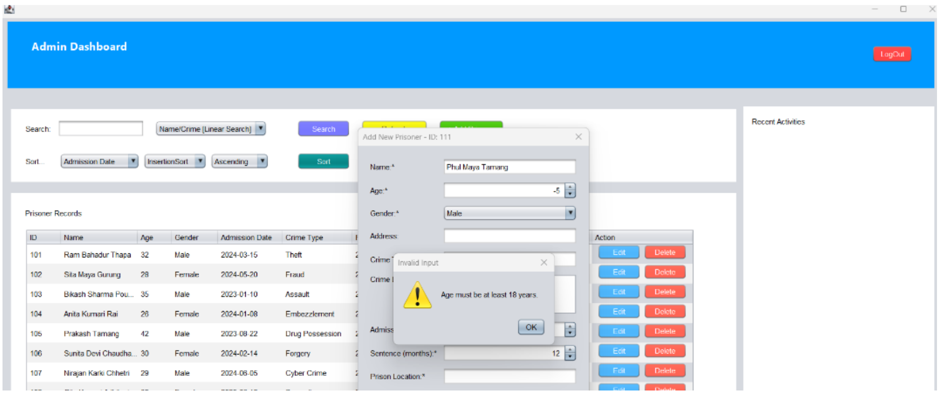
Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Release Date	Sentence (in ...	Location	Status	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	2025-09				Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	2026-05				Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	2024-07				Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	2027-01				Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	2027-08				Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	2025-10-14	20	Nepalgunj Jail, B...	Transferred	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	2026-10-05	28	Bharatpur Jail, C...	Solitary	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	2025-12-18	30	Bhairahawa Jail, ...	Parole	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	2029-04-12	60	Central Jail, Kath...	Active	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	2024-09-25	24	Central Jail, Kath...	Released	Edit Delete

Validation Error

Name is required and cannot be empty.

Test Case 02: TC_CREATE_PRISONER_NEGATIVE_AGE_VALIDATION

Field	**Details**
Test Case	02
Test Description	Validation: Create Prisoner with Negative Age
Activity	Input: Click "Add Prisoner" button, Name: "Phul Maya Chaudhary", Age: -5, Gender: "Female", Crime: "Assault", Admission Date: "2025-12-26", Sentence Duration: 24 months, Location: "Purwanchal Prison", Status: "Active"
Expected Output	System should reject the entry and display error message: "Age must atleast 18 years. No prisoner record should be created. PrisonerRecordTable should not update.
Actual Output	System rejected the entry and displayed error message: "Age must atleast 18 years. No prisoner record was created. PrisonerRecordTable not updated.
Evidence	 *Figure 29: Error message for negative age*
Remarks	Test Successful

Add New Prisoner - ID: 111

Name:* Phul Maya Tamang
Age:* -5
Gender:* Male
Address:
Sentence (months):* 12
Prison Location:*

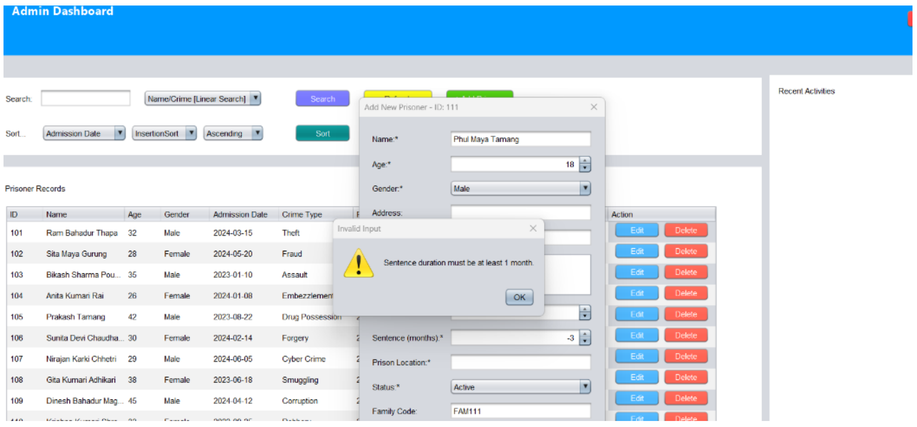
Invalid Input

Age must be at least 18 years.

OK

ID	Name	Age	Gender	Admission Date	Crime Type
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime

Test Case 03: CREATE_PRISONER_NEGATIVE_SENTENCE_VALIDATION

Field	**Details**
Test Case	03
Test Description	Validation: Create Prisoner with Negative Sentence Duration
Activity	Input: Click "Add Prisoner" button, Name: "Jane Smith", Age: 30, Gender: "Female", Crime: "Fraud", Admission Date: "15/12/2024", Sentence Duration: -10 months, Location: "Cell Block C", Status: "Active"
Expected Output	System should handle validation and display error message: "Sentence duration must be atleast 1 month." Record should not be added to LinkedList.
Actual Output	System handled validation and displayed error message: "Sentence duration must be atleast 1 month." Record was not added to LinkedList.
Evidence	 Figure 30: Error message for negative sentence period
Remarks	Test Successful

Admin Dashboard

Search: | Name/Crime [Linear Search]

Sort... Admission Date | InsertionSort | Ascending

Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption

Add New Prisoner - ID: 111

Name:* Phul Maya Tamang

Age:* 18

Gender:* Male

Address:

Sentence (months):* -3

Prison Location:*

Status:* Active

Family Code: FAM111

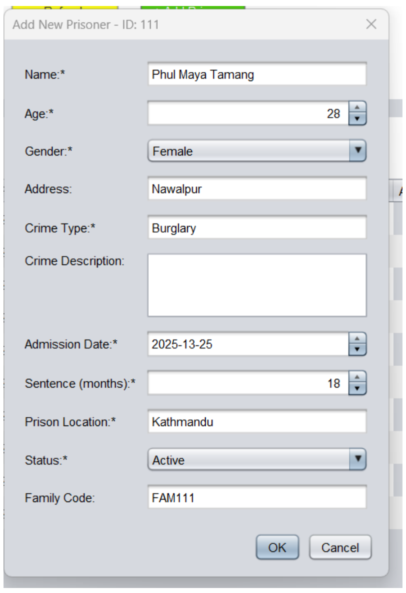
Invalid Input

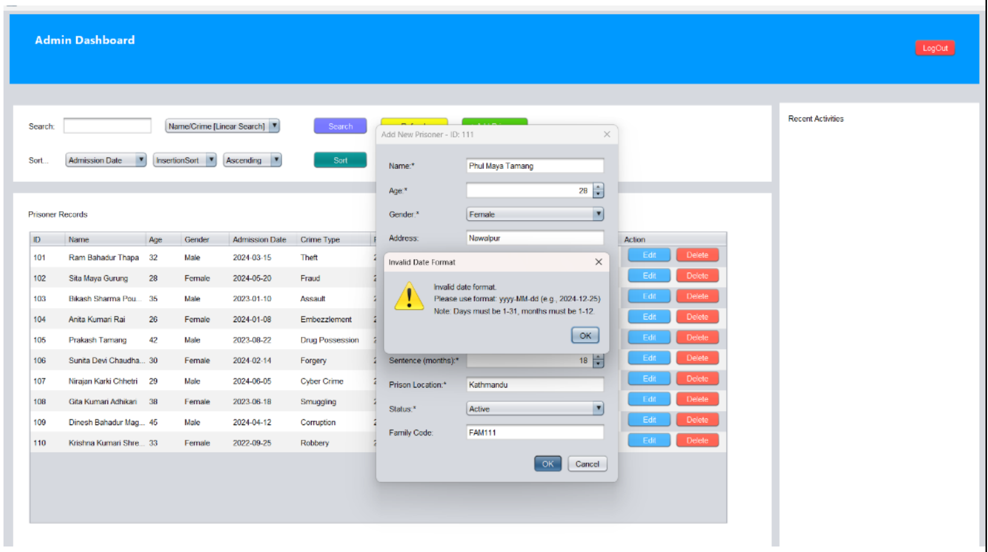
Sentence duration must be at least 1 month.

OK

Recent Activities

Test Case 04: CREATE_PRISONER_INVALID_DATE_FORMAT_EXCEPTION

Field	**Details**
Test Case	04
Test Description	Exception Handling: Create Prisoner with Invalid Date Format
Activity	Input: Click "Add Prisoner" button, Name: "Phul Maya Tamang", Age: 28, Gender: "Female", Crime: "Burglary", Admission Date: "invalid-date" or "32/13/2025", Sentence Duration: 18 months, Location: "Kathmandu", Status: "Active"
Expected Output	System should handle DateTimeParseException gracefully and display error message: "Invalid date format. Please use DD/MM/YYYY". No record should be created.
Actual Output	System handled DateTimeParseException gracefully and displayed error message: "Invalid date format. Please use DD/MM/YYYY" . No record was created.
Evidence	 Add New Prisoner - ID: 111 Name:* Phul Maya Tamang Age:* 28 Gender:* Female Address: Nawalpur Crime Type:* Burglary Crime Description: Admission Date:* 2025-13-25 Sentence (months):* 18 Prison Location:* Kathmandu Status:* Active Family Code: FAM111 *Figure 31: Add Prisoner with invalide Date format*

Field	**Details**
	 *Figure 32: Invalid Date Format Error message*
Remarks	Test Successful

Admin Dashboard

LogOut

Search: Name/Crime [Linear Search] Search

Sort... Admission Date InsertionSort Ascending Sort

Recent Activities

Prisoner Records

ID	Name	Age	Gender	Admission Date	Crime Type	Action
101	Ram Bahadur Thapa	32	Male	2024-03-15	Theft	Edit Delete
102	Sita Maya Gurung	28	Female	2024-05-20	Fraud	Edit Delete
103	Bikash Sharma Pou...	35	Male	2023-01-10	Assault	Edit Delete
104	Anita Kumari Rai	26	Female	2024-01-08	Embezzlement	Edit Delete
105	Prakash Tamang	42	Male	2023-08-22	Drug Possession	Edit Delete
106	Sunita Devi Chaudha...	30	Female	2024-02-14	Forgery	Edit Delete
107	Nirajan Karki Chhetri	29	Male	2024-06-05	Cyber Crime	Edit Delete
108	Gita Kumari Adhikari	38	Female	2023-06-18	Smuggling	Edit Delete
109	Dinesh Bahadur Mag...	45	Male	2024-04-12	Corruption	Edit Delete
110	Krishna Kumari Shre...	33	Female	2022-09-25	Robbery	Edit Delete

Add New Prisoner - ID: 111

Name:* Phul Maya Tamang

Age:* 28

Gender:* Female

Address: Nawalpur

Sentence (months):* 18

Prison Location:* Kathmandu

Status:* Active

Family Code: FAM111

OK Cancel

Invalid Date Format

Invalid date format.
Please use format: yyyy-MM-dd (e.g., 2024-12-25)
Note: Days must be 1-31, months must be 1-12.

OK

Test Case 05

Name: TC_READ_SEARCH_NON_NUMERIC_ID_EXCEPTION

Field	**Details**
Test Case	05
Test Description	Exception Handling: Read/Search with Non-Numeric ID (Binary Search)
Activity	Input: Select Search Type: "ID Binary Search", Enter Search Term: "ABC123" (String instead of number), Click "Search" button
Expected Output	System should handle NumberFormatException and display error message: "Please enter a valid numeric ID" or "ID must be a number". Search should not execute. No system crash should occur. Console should show exception handling message.
Actual Output	[To be filled after testing]
Evidence	[Screenshot showing error dialog + Console output]

Test Case 06

Name: TC_READ_SEARCH_EMPTY_SEARCH_TERM_VALIDATION

Field	**Details**
Test Case	06
Test Description	Validation: Read/Search with Empty Search Term
Activity	Input: Select Search Type: "Name/Crime Linear Search", Search Term: "" (empty), Click "Search" button
Expected Output	System should display warning message: "Please enter a search term" before executing search. Search operation should not proceed. Table should remain unchanged showing all prisoners.
Actual Output	[To be filled after testing]

Field	Details
Evidence	[Screenshot of warning dialog]

Test Case 07

Name: TC_UPDATE_PRISONER_NON_EXISTENT_VALIDATION

Field	Details
Test Case	07
Test Description	Validation: Update Non-Existent Prisoner Record
Activity	Input: Manually attempt to update prisoner with ID: 99999 (doesn't exist), Modified fields: Name, Age, Crime, etc.
Expected Output	System should detect non-existent prisoner and display error message: "Prisoner with ID 99999 not found" or "Cannot update: Prisoner does not exist". Update operation should be cancelled. LinkedList should remain unchanged.
Actual Output	[To be filled after testing]
Evidence	[Screenshot of error message]

Test Case 08

Name: TC_UPDATE_PRISONER_INVALID_AGE_VALIDATION

Field	Details
Test Case	08
Test Description	Validation: Update Prisoner with Invalid Age Value
Activity	Input: Click "Edit" button on existing prisoner row, Keep all fields same except: Age: -15 or 0 or 200 (out of valid range), Click "Update"

Field	Details
Expected Output	System should reject update and display error message: "Age must be between 18 and 150" or "Please enter a valid age". Original prisoner data should remain unchanged in LinkedList and table.
Actual Output	[To be filled after testing]
Evidence	[Screenshot showing validation error]

Test Case 09

Name: TC_DELETE_NON_EXISTENT_PRISONER_VALIDATION

Field	Details
Test Case	09
Test Description	Validation: Delete Non-Existent Prisoner Record
Activity	Input: Attempt to delete prisoner with ID: 99999 (doesn't exist in LinkedList), Click "Delete" button
Expected Output	System should display error message: "Prisoner with ID 99999 not found" or "Cannot delete: Prisoner does not exist". No deletion should occur. Trash bin (Stack) should not be updated. Table should remain unchanged.
Actual Output	[To be filled after testing]
Evidence	[Screenshot of error dialog]

Test Case 10

Name: TC_DELETE_AND_RESTORE_STACK_OPERATION

Field	Details
Test Case	10

Field	**Details**
Test Description	Functional Testing: Delete Prisoner and Restore from Trash (Stack LIFO)
Activity	Input: Select an existing prisoner (e.g., ID: 101), Click "Delete" button (Prisoner moved to trash - Stack push), Click "Trash Bin" button, Select "Restore Last Deleted" (Stack pop operation), Click "Refresh" to verify
Expected Output	Delete: Prisoner removed from LinkedList and pushed to trash Stack. Success message: "Prisoner deleted and moved to trash". Restore: Last deleted prisoner popped from Stack and restored to LinkedList. Success message: "Prisoner restored successfully". Prisoner should reappear in PrisonerRecordTable with same data. Console should show Stack LIFO operations.
Actual Output	[To be filled after testing]
Evidence	[Screenshots: Before delete, After delete, Trash contents, After restore + Console output]

7. Conclusion

The Prison Management System project effectively demonstrates how core concepts of data structures and algorithms can be applied to a realistic and socially relevant administrative domain. By contextualizing theoretical computer science principles within the challenges faced by Nepal’s overcrowded prison system, the project successfully bridges the gap between abstract learning and practical implementation. The adoption of the Model-View-Controller (MVC) architecture ensures a clear separation of concerns, enabling organized code structure, improved maintainability, and scalability. Through distinct responsibilities assigned to the model, controller, and view components, the system reflects sound software engineering practices aligned with industry standards.

The implementation of fundamental data structures such as Linked Lists, Queues, and Stacks addresses the dynamic nature of prison data, including frequent admissions, releases, and record updates. Additionally, the use of searching and sorting algorithms provides efficient data retrieval and structured presentation, reinforcing algorithmic reasoning within a real-world dataset. These design choices not only satisfy academic requirements of the CS5005 module but also illustrate how disciplined application of algorithms can enhance administrative efficiency, transparency, and data consistency.

Beyond its role as an educational exercise, this project offers conceptual insight into how information systems can support institutional decision-making in complex environments. Features such as input validation, modular design, and a user-friendly interface emphasize the importance of reliability and usability in administrative software. Overall, the Prison Management System reinforces the value of algorithmic thinking, structured design, and architectural planning in developing scalable and maintainable systems, while preparing students with practical competencies applicable to future professional and academic endeavors.

8. Future Works

While the Prison Management System fulfills its academic objectives and demonstrates effective application of data structures and software design principles, several enhancements can be explored in future iterations to improve scalability, functionality, and real-world applicability.

A. Advanced Data Structures and Algorithms

Future versions of the system may incorporate more advanced data structures to improve efficiency and analytical capability. Hash Tables could be used to enable faster prisoner record retrieval in large datasets, while Priority Queues may support handling of urgent cases such as medical emergencies or court hearings. Tree-based structures, such as balanced search trees, could maintain sorted records efficiently and support statistical queries for reporting and analysis.

B. Database Integration and Persistence

Currently, the system operates with in-memory data storage, limiting persistence and scalability. Integrating a relational database would allow permanent data storage, concurrent access, and structured querying using SQL. This enhancement would also support features such as data backup, audit logging, and multi-user access, making the system more suitable for institutional use.

C. Web-Based Deployment and API Support

Migrating the application from a desktop-based Java Swing environment to a web-based architecture would improve accessibility and deployment flexibility. A web application with RESTful APIs would allow integration with external systems such as court or law enforcement platforms and enable access across multiple devices without local installation.

D. Security and Access Control

Future development should strengthen system security through role-based access control to ensure that sensitive data is accessed only by authorized personnel. Implementing authentication mechanisms, encrypted data handling, and activity logging would improve data protection and accountability.

E. Basic Analytics and Reporting

The system could be extended with basic reporting features, such as occupancy summaries, crime-type distributions, and release forecasts. Simple visualizations and downloadable reports would support administrative decision-making without introducing unnecessary system complexity.

9. Bibliography

Anon., n.d. *MVC Framework - Introduction.* [Online]
Available at:
https://www.tutorialspoint.com/mvc_framework/mvc_framework_introduction.htm
[Accessed 26 December 2025].

Apache Ant Project, n.d. *Apache Ant Manual.* [Online]
Available at: https://ant.apache.org/manual/
[Accessed 26 December 2025].

Gamma, E., Helm, R., Johnson, R. & Vlissides, J., 1994 . Design Patterns: Elements of Reusable Object-Oriented Software. In: s.l.:Addison-Wesley.

GeeksforGeeks, 2023. *MVC Architecture.* [Online]
Available at: https://www.geeksforgeeks.org/mvc-design-pattern/
[Accessed 26 December 2025].

IBM, 2021. *UML Basics: The Class Diagram.* [Online]
Available at: https://www.ibm.com/docs/en/rational-soft-arch/9.6.1?topic=diagrams-class
[Accessed 26 December 2025].

Kathmandu School of Law Review, 2022. *Prison Management and Overcrowding in Nepal.* [Online]
Available at: https://kslreview.org/index.php/kslr/article/download/2201/1541
[Accessed 2026 December 2025].

The Kathmandu Post, 2023. *Violent clashes continue in Nepal’s overcrowded prisons.* [Online]
Available at: https://kathmandupost.com/national/violent-clashes-continue-in-nepal-s-overcrowded-prisons
[Accessed 26 December 2025].

10. Appendix