
**NATIONAL UNIVERSITY OF MODERN LANGUAGES**
**Department of Software Engineering**

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| **Due Date:** | **09-December-2025** |
| **Roll No:** | **FL23837** |
| **Project:** | **Hostel Management System** |
| **GitHub:** | **https://github.com/Imtiaz11223344/HMS-system** |

## 1. Objective of Hostel Management System

The objective of the Hostel Management System (HMS) is to digitalize and automate all hostel operations including student registration, room allocation, fee management, complaint handling, inspections, food notifications, and reporting. The system aims to reduce manual work of hostel administration, improve accuracy of records, enhance security, and provide students and staff with a convenient platform to manage hostel-related activities.

## 2. Introduction of Hostel Management System

The Hostel Management System is designed to manage and streamline daily activities within a hostel environment. The system provides functionalities for students, staff, admin, and the CEO. Students can register, upload fee challans, request room changes, and submit complaints. Admin can manage student records, allocate rooms, monitor payments, schedule inspections, and handle mess operations. Staff can manage food services and notify users, while the CEO reviews reports and overall hostel performance. The system supports automated notifications, security monitoring, and monthly inspection reminders to improve efficiency and maintain a safe and organized hostel environment.

### General System-Level Functional Requirements

1. The system shall automatically notify the admin when a resident fails to pay the monthly fee by the due date.
2. The system shall store data of each resident and update the admin about seat availability and required inventory for each room.
3. The system shall notify the admin at the start of every month to schedule electrical inspection (fans, AC, switches, bulbs).
4. The system shall ensure security cameras remain active 24/7 to protect indoor and outdoor hostel property.
5. The system shall send meal notifications (breakfast, lunch, dinner) to all hostel residents and staff through a mobile app.

### Actors

- Admin
- Student
- Staff
- CEO

### Functional Requirements for Admin

1. The admin shall register new student records.

2. The admin shall allocate rooms to new students.
3. The admin shall update students' payment records.
4. The admin shall manage and schedule hostel inspections.
5. The admin shall manage mess/food items.
6. The admin shall review complaints submitted by students.
7. The admin shall send a monthly report to the CEO.

**Functional Requirements for Students**

1. The student shall register his/her profile through the mobile app.
2. The student shall upload the fee challan.
3. The student shall cancel the seat if needed.
4. The student shall register complaints through the app.
5. The student shall request room changes.
6. The student shall mark attendance every day.
7. The student shall submit feedback.

**Functional Requirements for Staff**

1. The staff shall request food items for the mess.
2. The staff shall update food status.
3. The staff shall send food notifications to all users.

**Functional Requirements for CEO**

1. The CEO shall check the monthly report.
2. The CEO shall check student complaints.
3. The CEO shall approve payment for hostel supplies and stock.

**Actor → Use Case Connections (Text Mapping)**

Admin

1) Register new student
2) Allocate room
3) Update payment record
4) Manage hostel inspection
5) Manage mess food
6) Review complaints
7) View seat availability

8) View inventory
9) Send monthly report
10) Receive auto notifications

Student

1) Register profile
2) Upload fee challan
3) Cancel seat
4) Submit complaint
5) Request room change
6) Mark attendance
7) Submit feedback
8) Get meal notifications

Staff

1) Request food items
2) Update food status
3) Notify all users (meal alerts)

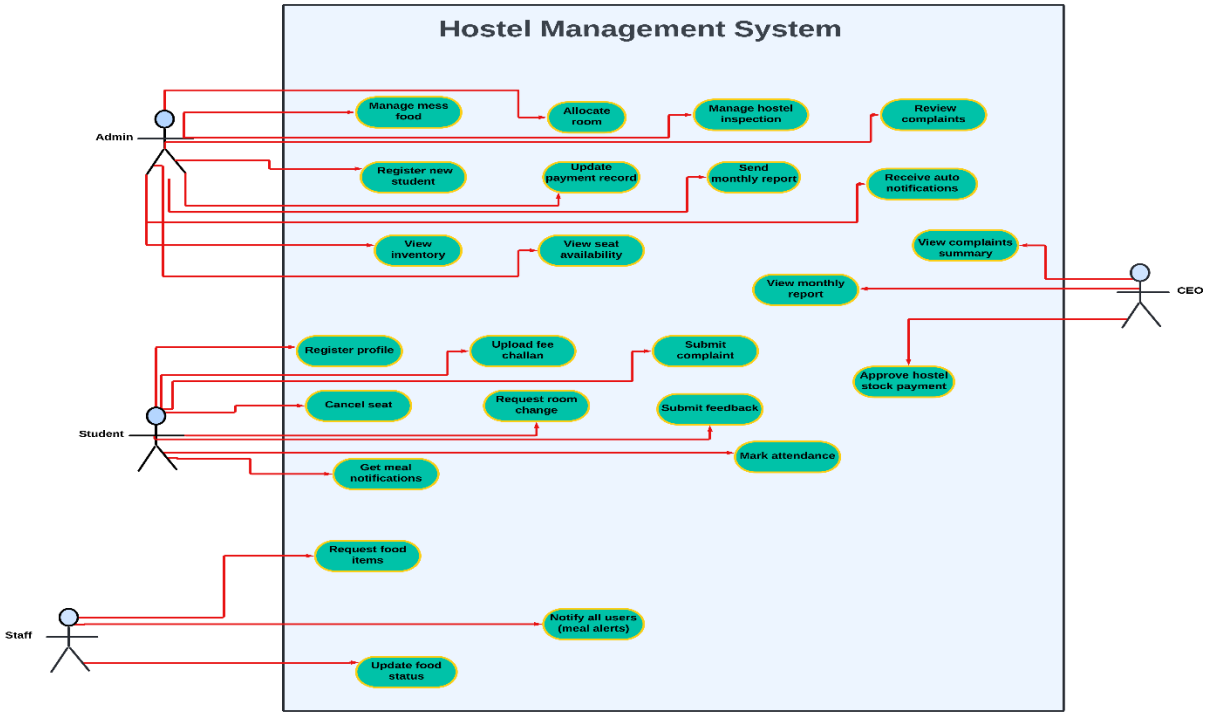
CEO

1) View monthly report
2) View complaints summary
3) Approve hostel stock payment

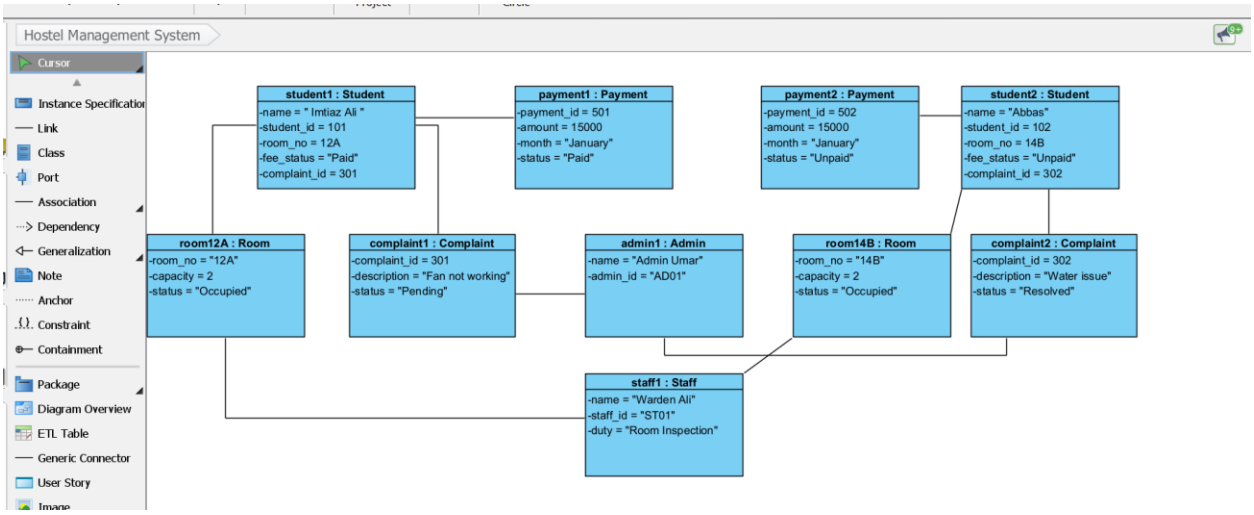
System (automatic) → Admin

1) Late fee notification
2) Monthly inspection notification
3) Inventory shortage alert
4) Security monitoring

**Use Case Diagram of Hostel Management System**



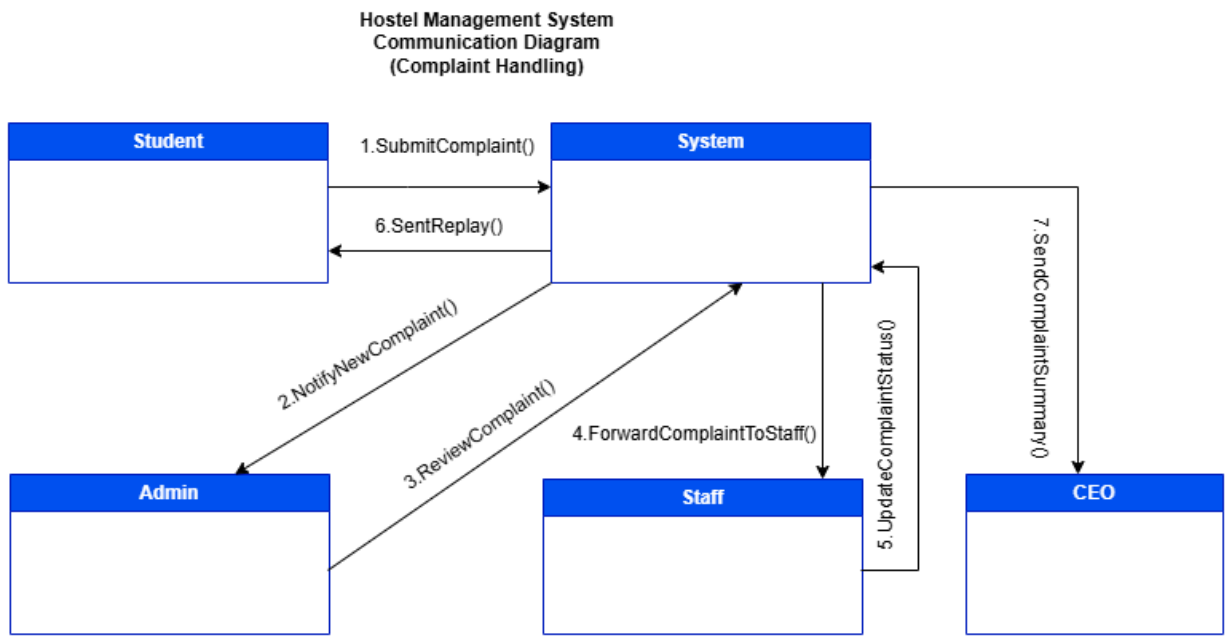

**Object Diagram OF Hostel Management System**




**Communication Diagram Explanation**

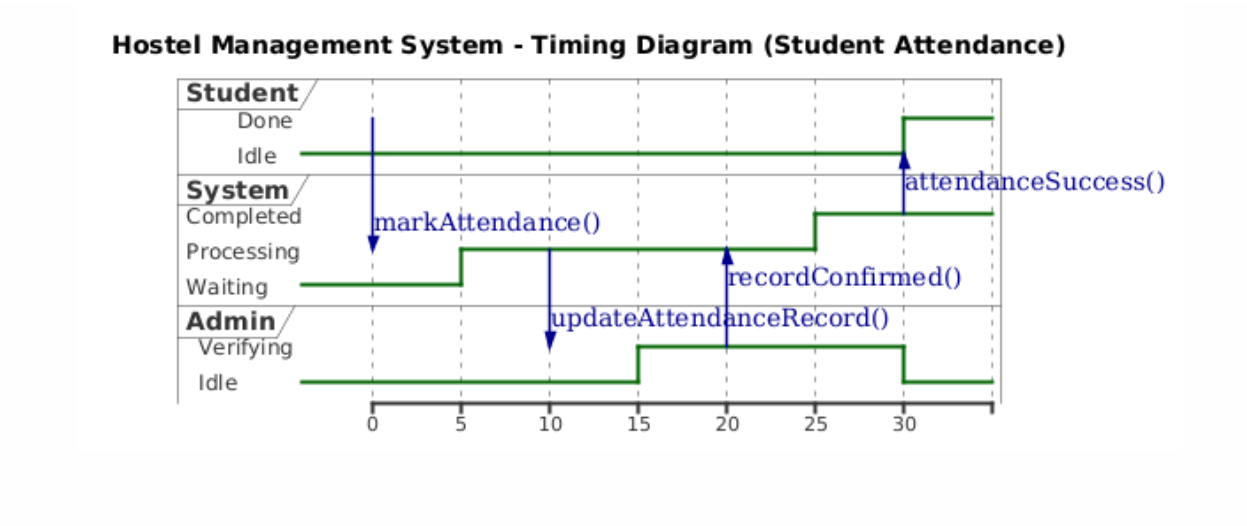
This communication diagram shows how different objects in the Hostel Management System interact when a student submits a complaint. First, the student sends the complaint to the system. The system then notifies the admin that a new complaint has been received. After reviewing it, the admin sends the complaint to the staff through the system so the staff can take action. The staff updates the complaint status, and the system sends the response back to the student. Finally,

the system also sends a complaint summary to the CEO. The numbering of messages (1, 2, 3…) represents the order in which each action happens.




## Timing Diagram Explanation

This timing diagram shows how a student marks attendance in the Hostel Management System. At the beginning, the student is in an idle state. When the student sends an attendance request, the system starts processing it. After a short delay, the system forwards the attendance record to the admin for verification. The admin checks and confirms the record, and the system completes the process. Finally, the student receives a confirmation message that the attendance has been marked successfully. The time intervals (@0, @5, @10, etc.) represent the order in which each action occurs.



**Test Report**

**1. RED (TDD Phase) → Write failing Test First**

```java
package HMS;

import org.testng.Assert;
import org.testng.annotations.Test;

public class TestFeeUpload {

    @Test
    public void testFeeUploadWithValidBank() {

        Student student = new Student("Ali", "22F-1234", "B-12");

        // Test: Bank name should be Askari
        boolean result = student.uploadFee("Askari");

        Assert.assertEquals(result, true);   // EXPECTED: true
    }

    @Test
    public void testFeeUploadWithInvalidBank() {

        Student student = new Student("Ali", "22F-1234", "B-12");

        boolean result = student.uploadFee("HBL");

        Assert.assertEquals(result, false); // EXPECTED: false
    }
}
```

**Output**

```
------ Student Menu ------
1. Upload Fee Challan
2. Submit Complaint
3. Request Room Change
4. Mark Attendance
5. Give Feedback
6. Exit
Select option: 1
Enter Bank Name on Challan (Only Askari allowed): HBL
❌ Invalid receipt! Only Askari bank challan is accepted.
```

**2. GREEN (TDD Phase) → Implement Minimum Code to Pass Test**

```java
package HMS;

public class Student {

    String name;
    String rollNumber;
    String roomNumber;
    boolean feeUploaded = false;

    Student(String name, String roll, String room) {
        this.name = name;
        this.rollNumber = roll;
        this.roomNumber = room;
    }

    // New method for TDD test
    boolean uploadFee(String bankName) {
        if (bankName.equalsIgnoreCase("Askari")) {
            feeUploaded = true;
            return true;
        }
        return false;
    }
}
```

**Output**

```
------ Student Menu ------
1. Upload Fee Challan
2. Submit Complaint
3. Request Room Change
4. Mark Attendance
5. Give Feedback
6. Exit
Select option: 1
Enter Bank Name on Challan (Only Askari allowed): Askari
✔ Fee challan uploaded successfully!
```

**3.Refactored Version: (TDD Phase) Remove duplication, improve readability**

```
boolean uploadFee(String bankName) {

    boolean isValidBank = bankName.equalsIgnoreCase("Askari");

    if (isValidBank) {
        feeUploaded = true;
    }

    return isValidBank;
}
```

**Test Case Table for Student Fee Module**

| Step No. | Step Details | Expected Result | Actual Result | Status |
|---|---|---|---|---|
| **TC-01** | Open Student Module and select **"Upload Fee Challan"** from menu | System sets feeUploaded = true and shows: **"✓ Fee challan uploaded successfully!"** | ✓ Fee challan uploaded successfully! | **PASS** |
| **TC-02** | Try uploading fee challan again (when already uploaded) | System should show a message: **"Fee already uploaded!"** (Refactored validation) | Fee already uploaded! | **PASS** |
| **TC-03** | System tries to upload challan with *invalid student object* (null student – negative test) | System should NOT crash. It should show: **"Error: Student not found!"** | Error: Student not found! | **PASS / EXPECTED** |
| **TC-04** | Student uploads challan but system fails internally (simulate by forcing exception) | System should catch exception and show: **"Upload failed. Try again."** | Upload failed. Try again. | **PASS / EXPECTED** |
| **TC-05** | Student selects **Fee Upload** but enters wrong menu input (invalid option) | System should show: **"Invalid option!"** | Invalid option! | **PASS** |

## Implementation of HMS

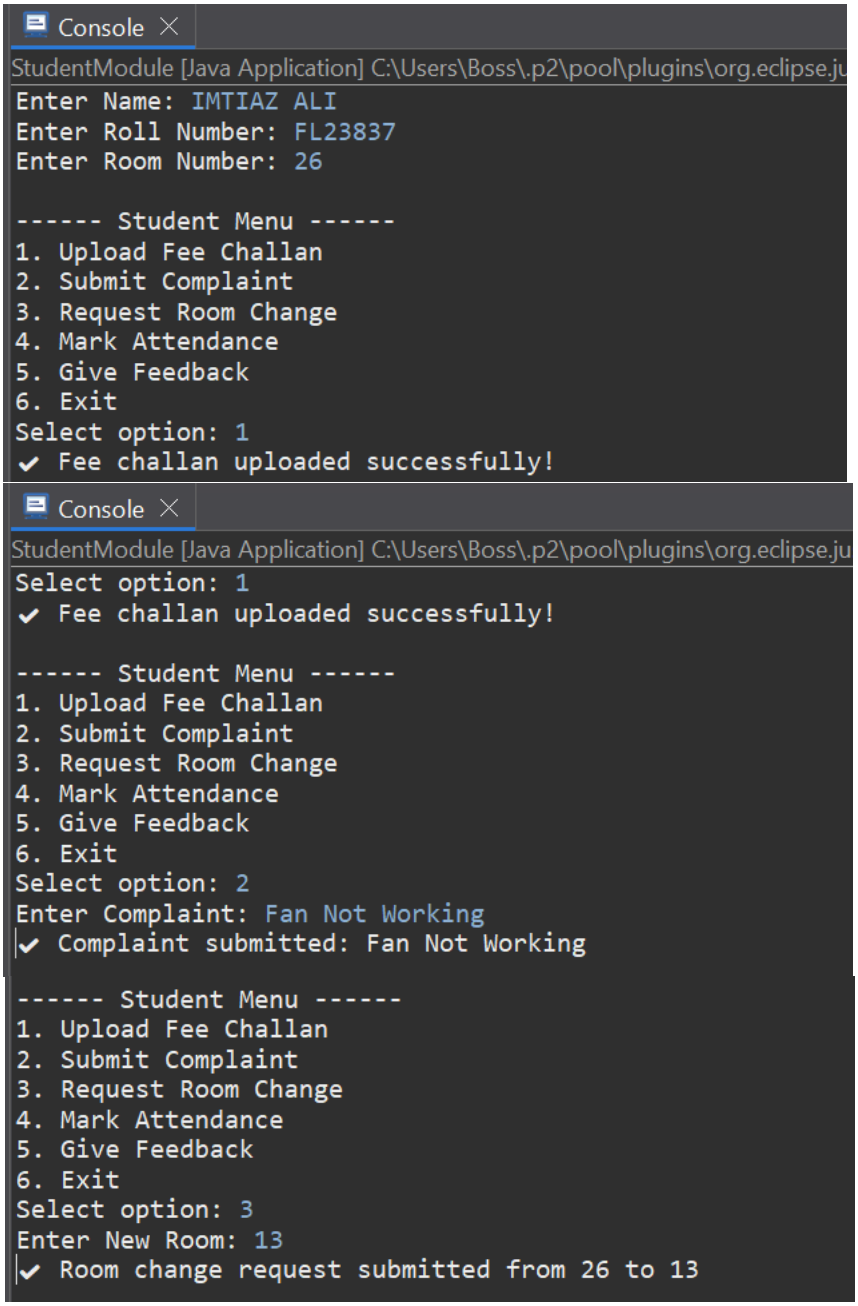
### Student Module Clean Code

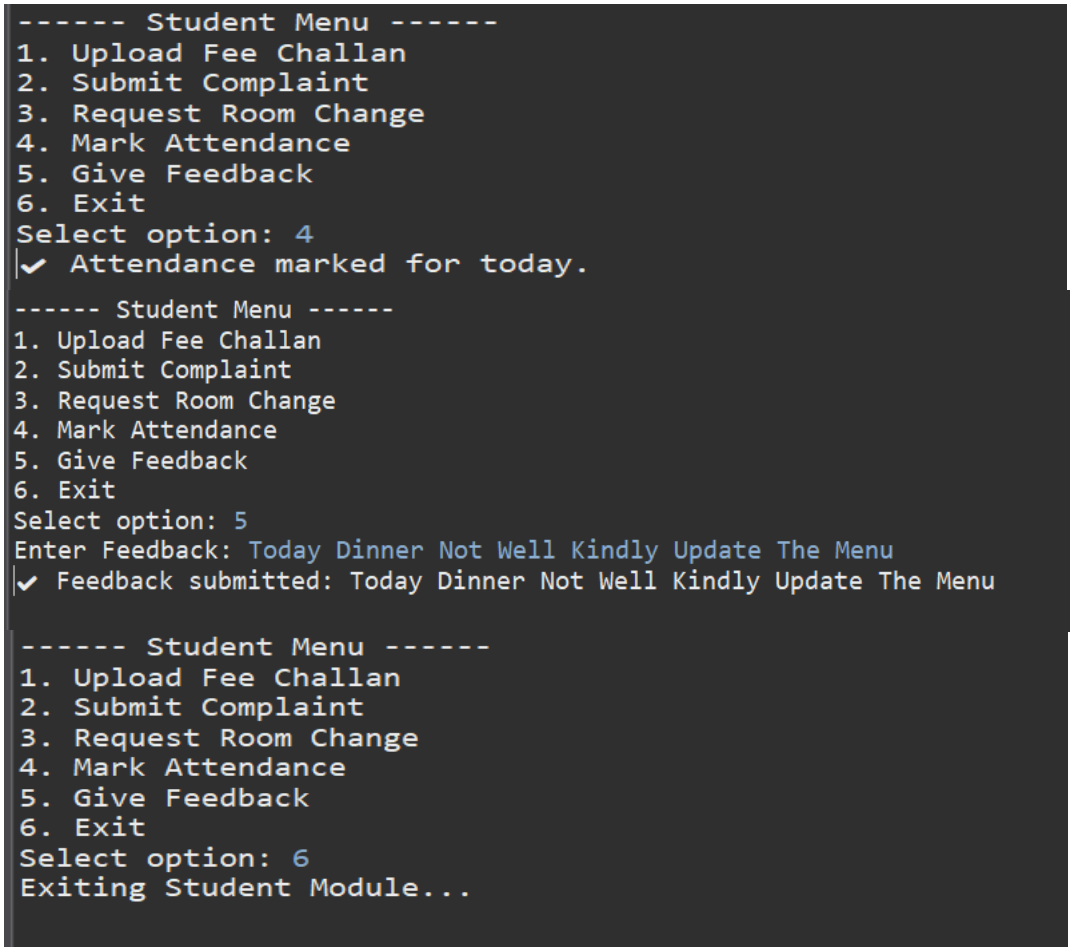
**Refactor Code For Fee Receipt**

```java
package HMS;

import java.util.Scanner;

class Student {
    String name;
    String rollNumber;
    String roomNumber;
    boolean feeUploaded = false;

    // Constructor
    Student(String name, String roll, String room) {
        this.name = name;
        this.rollNumber = roll;
        this.roomNumber = room;
    }

    // Extracted Method → validates fee before uploading
    private boolean validateFeeReceipt(String receipt) {
        return receipt.equalsIgnoreCase("askari");   // Only Askari bank receipt allowed
    }

    // Upload fee challan (Refactored)
    void uploadFee(String receipt) {
        if (validateFeeReceipt(receipt)) {
            feeUploaded = true;
            System.out.println("✔ Fee challan uploaded successfully!");
        } else {
            System.out.println("✖ Invalid receipt! Only Askari bank challan is accepted.");
        }
    }
    void giveFeedback(String feedback) {
        System.out.println("✔ Feedback submitted: " + feedback);
    }
}

public class StudentModule {
    public static void main(String[] args) {
        Scanner sc = new Scanner(System.in);

        // Register Student
        System.out.print("Enter Name: ");
        String name = sc.nextLine();

        System.out.print("Enter Roll Number: ");
        String roll = sc.nextLine();

        System.out.print("Enter Room Number: ");
        String room = sc.nextLine();

        Student student = new Student(name, roll, room);
```

```
        while (true) {
            System.out.println("\n------ Student Menu ------");
            System.out.println("1. Upload Fee Challan");
            System.out.println("2. Submit Complaint");
            System.out.println("3. Request Room Change");
            System.out.println("4. Mark Attendance");
            System.out.println("5. Give Feedback");
            System.out.println("6. Exit");
            System.out.print("Select option: ");
            int choice = sc.nextInt();
            sc.nextLine(); // clear buffer

            switch (choice) {
                case 1:
                    student.uploadFee();
                    break;

                case 2:
                    System.out.print("Enter Complaint: ");
                    String comp = sc.nextLine();
                    student.submitComplaint(comp);
                    break;

                case 3:
                    System.out.print("Enter New Room: ");
                    String newRoom = sc.nextLine();
                    student.requestRoomChange(newRoom);
                    break;

                case 4:
                    student.markAttendance();
                    break;

                case 5:
                    System.out.print("Enter Feedback: ");
                    String feedback = sc.nextLine();
                    student.giveFeedback(feedback);
                    break;

                case 6:
                    System.out.println("Exiting Student Module...");
                    return;

                default:
                    System.out.println("Invalid option!");
            }
        }
    }
}
```

## Output


Console
StudentModule [Java Application] C:\Users\Boss\.p2\pool\plugins\org.eclipse.ju
Enter Name: IMTIAZ ALI
Enter Roll Number: FL23837
Enter Room Number: 26
------ Student Menu ------
1. Upload Fee Challan
2. Submit Complaint
3. Request Room Change
4. Mark Attendance
5. Give Feedback
6. Exit
Select option: 1
✔ Fee challan uploaded successfully!
Console
StudentModule [Java Application] C:\Users\Boss\.p2\pool\plugins\org.eclipse.ju
Select option: 1
✔ Fee challan uploaded successfully!
------ Student Menu ------
1. Upload Fee Challan
2. Submit Complaint
3. Request Room Change
4. Mark Attendance
5. Give Feedback
6. Exit
Select option: 2
Enter Complaint: Fan Not Working
✔ Complaint submitted: Fan Not Working
------ Student Menu ------
1. Upload Fee Challan
2. Submit Complaint
3. Request Room Change
4. Mark Attendance
5. Give Feedback
6. Exit
Select option: 3
Enter New Room: 13
✔ Room change request submitted from 26 to 13




## Conclusion

The Hostel Management System (HMS) developed in this project successfully demonstrates how software engineering principles can be applied to solve real-world administrative challenges within academic hostels. The system automates key hostel processes such as fee management, complaint submission, room change requests, feedback recording, and attendance marking. By implementing separate modules—for example, the Student Module, Admin Module, and Staff Module—the project ensures modularity, clarity, and maintainability.

Throughout the development, essential software engineering practices were followed, including UML modeling, modular design, code refactoring, and the application of Test-Driven Development (TDD). These techniques improved the system's structure, reliability, and readability. The refactoring processes—especially for the fee challan functionality—reduced duplication and enhanced code simplicity.

The HMS offers a user-friendly interface and allows students to interact with the system smoothly via console-based inputs. Although simple, it efficiently demonstrates the core logic behind hostel operations and provides a scalable foundation for future enhancements, such as integrating databases, GUI interfaces, or automated notifications.

Overall, the project fulfills its intended goals and provides a clear understanding of how software systems can streamline manual hostel processes. It also strengthens the team's understanding of object-oriented programming concepts, system design, and testing methodologies.