



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## Experiment 4

**Student Name:** Ashish Sehrawat

**UID:** 22BCS10449

**Branch:** BE-CSE

**Section/Group:** 904-A

**Semester:** 6th

**Date of Performance:**

**Subject Name:** Project based Learning Java

**Subject Code:** 22CSH-359

### **Problem :- 1(Easy-Level)**

**1. Aim:** Write a Java program to implement an ArrayList that stores employee details (ID, Name, and Salary). Allow users to add, update, remove, and search employees.

#### **2. Objective:**

- To create a Java program using ArrayList to store and manage employee details.
- To implement operations such as adding, updating, removing, and searching employees based on their ID.
- To enhance understanding of collections in Java, particularly ArrayList.

#### **3. Algorithm:**

- Define an Employee class with attributes: id, name, and salary.
- Create an ArrayList<Employee> to store employee records.
- Implement functions for:
  - **Adding** an employee.
  - **Updating** employee details based on the ID.
  - **Removing** an employee by ID.
  - **Searching** for an employee by ID.
- Provide a menu-driven interface to perform operations

#### **4. Implementation :**

```
import java.util.ArrayList;
```

```
import java.util.Scanner;
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
class Employee {  
  
    int id;  
  
    String name;  
  
    double salary;  
  
    public Employee(int id, String name, double salary) {  
  
        this.id = id;  
  
        this.name = name;  
  
        this.salary = salary;  
  
    }  
  
    public String toString() {  
  
        return "ID: " + id + ", Name: " + name + ", Salary: " + salary;  
  
    }  
}  
  
public class EmployeeManagement {  
  
    static ArrayList<Employee> employees = new ArrayList<>();  
  
    static Scanner sc = new Scanner(System.in);  
  
    public static void addEmployee() {  
  
        System.out.print("Enter ID: ");  
  
        int id = sc.nextInt();
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
        sc.nextLine(); // Consume newline

        System.out.print("Enter Name: ");

        String name = sc.nextLine();

        System.out.print("Enter Salary: ");

        double salary = sc.nextDouble();

        employees.add(new Employee(id, name, salary));

        System.out.println("Employee added successfully!");

    }

    public static void updateEmployee() {

        System.out.print("Enter Employee ID to update: ");

        int id = sc.nextInt();

        for (Employee emp : employees) {

            if (emp.id == id) {

                sc.nextLine(); // Consume newline

                System.out.print("Enter new Name: ");

                emp.name = sc.nextLine();

                System.out.print("Enter new Salary: ");

                emp.salary = sc.nextDouble();

                System.out.println("Employee details updated.");

                return;

            }

        }

    }
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
        System.out.println("Employee not found.");
    }

    public static void removeEmployee() {

        System.out.print("Enter Employee ID to remove: ");

        int id = sc.nextInt();

        employees.removeIf(emp -> emp.id == id);

        System.out.println("Employee removed successfully!");
    }

    public static void searchEmployee() {

        System.out.print("Enter Employee ID to search: ");

        int id = sc.nextInt();

        for (Employee emp : employees) {

            if (emp.id == id) {

                System.out.println(emp);

                return;

            }

        }

        System.out.println("Employee not found.");
    }

    public static void main(String[] args) {

        while (true) {
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
System.out.println("\n1. Add Employee\n2. Update Employee\n3. Remove  
Employee\n4. Search Employee\n5. Exit");
```

```
System.out.print("Choose an option: ");
```

```
int choice = sc.nextInt();
```

```
switch (choice) {
```

```
    case 1: addEmployee(); break;
```

```
    case 2: updateEmployee(); break;
```

```
    case 3: removeEmployee(); break;
```

```
    case 4: searchEmployee(); break;
```

```
    case 5: System.out.println("Exiting..."); return;
```

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

```
}
```

```
}
```

```
}
```

```
}
```

## 5. Output:

```
1. Add Employee
2. Update Employee
3. Remove Employee
4. Search Employee
5. Exit
Choose an option: 1
Enter ID: 101
Enter Name: John Doe
Enter Salary: 50000
Employee added successfully!

Choose an option: 4
Enter Employee ID to search: 101
ID: 101, Name: John Doe, Salary: 50000.0
```

## Problem:- 2(Medium-level)

**1.Aim:**Create a program to collect and store all the cards to assist the users in finding all the cards in a given symbol using Collection interface.

### **2.Objective:**

- To create a system for managing and searching for playing cards.
- To use Java Collections (ArrayList) to store and retrieve cards efficiently.
- To implement a search function that returns all cards of a given symbol.

### **3.Algorithm:**

- **Define a Card class** with attributes: symbol and value.
- **Use an ArrayList<Card>** to store all cards.
- **Provide methods for:**
  - **Adding a card** to the collection.
  - **Finding all cards** of a given symbol.
- **Display results** in a user-friendly format.

### **4.Implementation/Code:**

```
import java.util.*;

class Card {

    private String symbol;

    private int value;


    public Card(String symbol, int value) {

        this.symbol = symbol;

        this.value = value;

    }

}
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
public String getSymbol() {  
    return symbol;  
}
```

```
public int getValue() {  
    return value;  
}
```

```
public String toString() {  
    return "Card{Symbol=\"" + symbol + "\", Value=\"" + value + "\"}";  
}  
}
```

```
public class CardCollection {  
    private Collection<Card> cards;
```

```
public CardCollection() {  
    cards = new ArrayList<>();  
}
```

```
public void addCard(String symbol, int value) {  
    cards.add(new Card(symbol, value));  
}
```

```
public List<Card> findCardsBySymbol(String symbol) {  
    List<Card> result = new ArrayList<>();  
    for (Card card : cards) {  
        if (card.getSymbol().equalsIgnoreCase(symbol)) {
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
        result.add(card);
    }
}
return result;
}
```

```
public static void main(String[] args) {
    CardCollection collection = new CardCollection();
    Scanner sc = new Scanner(System.in);

    // Adding some cards
    collection.addCard("Hearts", 10);
    collection.addCard("Spades", 7);
    collection.addCard("Hearts", 2);
    collection.addCard("Diamonds", 5);
    collection.addCard("Spades", 3);

    // User input to search
    System.out.print("Enter a card symbol to search: ");
    String symbol = sc.nextLine();
    List<Card> foundCards = collection.findCardsBySymbol(symbol);

    if (foundCards.isEmpty()) {
        System.out.println("No cards found for symbol: " + symbol);
    } else {
        System.out.println("Cards found:");
        for (Card card : foundCards) {
            System.out.println(card);
        }
    }
}
```



```
        }  
    }  
    sc.close();  
}  
}
```

## 5. Output:

```
Enter a card symbol to search: Hearts  
Cards found:  
Card{Symbol='Hearts', Value=10}  
Card{Symbol='Hearts', Value=2}
```

### Problem:- 3(Hard-level)

**1.Aim:**Develop a ticket booking system with synchronized threads to ensure no double booking of seats. Use thread priorities to simulate VIP bookings being processed first.

### 2.Objective:

- Implement **thread synchronization** to avoid race conditions.
- Use **thread priorities** to ensure VIP customers are served first.
- Maintain a list of available seats and track bookings.

### 3.Algorithm:

- Create a TicketBookingSystem **class** to manage available seats.
- Use **synchronization** in the bookSeat() method to prevent double booking.
- Define a Customer **thread** where VIP customers get higher priority.



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

- **Start multiple threads** for both VIP and regular customers.
- **Ensure VIP bookings are processed first** using thread priorities.

## 4.Implementation/Code:

```
import java.util.*;

class TicketBookingSystem {

    private Set<Integer> bookedSeats = new HashSet<>();
    private int totalSeats;

    public TicketBookingSystem(int totalSeats) {
        this.totalSeats = totalSeats;
    }

    public synchronized boolean bookSeat(int seatNumber, String customerName) {
        if (seatNumber < 1 || seatNumber > totalSeats) {
            System.out.println(customerName + " tried to book an invalid seat: " +
            seatNumber);
            return false;
        }
        if (bookedSeats.contains(seatNumber)) {
            System.out.println(customerName + " tried to book an already booked seat: " +
            seatNumber);
            return false;
        }
        bookedSeats.add(seatNumber);
        System.out.println(customerName + " successfully booked seat: " + seatNumber);
        return true;
    }
}
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
}
```

```
class Customer extends Thread {
```

```
    private TicketBookingSystem system;
```

```
    private int seatNumber;
```

```
    private String customerName;
```

```
    public Customer(TicketBookingSystem system, int seatNumber, String  
customerName, int priority) {
```

```
        this.system = system;
```

```
        this.seatNumber = seatNumber;
```

```
        this.customerName = customerName;
```

```
        setPriority(priority); // Set thread priority
```

```
    }
```

```
    public void run() {
```

```
        system.bookSeat(seatNumber, customerName);
```

```
    }
```

```
}
```

```
public class TicketBookingApp {
```

```
    public static void main(String[] args) {
```

```
        TicketBookingSystem system = new TicketBookingSystem(5);
```

```
        // Creating customer threads
```

```
        Customer vip1 = new Customer(system, 1, "VIP John", Thread.MAX_PRIORITY);
```

```
        Customer vip2 = new Customer(system, 2, "VIP Alice", Thread.MAX_PRIORITY);
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

```
Customer regular1 = new Customer(system, 3, "Regular Bob",  
Thread.NORM_PRIORITY);  
  
Customer regular2 = new Customer(system, 4, "Regular Eve",  
Thread.NORM_PRIORITY);  
  
Customer regular3 = new Customer(system, 2, "Regular Charlie",  
Thread.NORM_PRIORITY);  
  
// Start threads  
vip1.start();  
vip2.start();  
regular1.start();  
regular2.start();  
regular3.start();  
  
try {  
    vip1.join();  
    vip2.join();  
    regular1.join();  
    regular2.join();  
    regular3.join();  
} catch (InterruptedException e) {  
    e.printStackTrace();  
}  
  
System.out.println("All bookings processed.");  
}  
}
```



# DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

Discover. Learn. Empower.

## 6. Output:

```
VIP John successfully booked seat: 1
VIP Alice successfully booked seat: 2
Regular Bob successfully booked seat: 3
Regular Eve successfully booked seat: 4
Regular Charlie tried to book an already booked seat: 2
All bookings processed.
```

## 7. Learning Outcomes:

- Password validation using character type checks and length constraints.
- Efficient data management using Java Collections (ArrayList).
- Multi-threading with synchronized methods to prevent race conditions.
- Thread prioritization to handle VIP bookings first.
- Searching and filtering data using structured collections.
- Real-world application of Java concurrency for booking systems.