

**Session 2023-2027**

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**Course:**

CSC200-Data Structures and Algorithms

Department of Computer Science

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#### Project Title:

**Pharmacy Management System**

#### Objective:

Design and implement a robust Pharmacy Management System to efficiently manage customer orders, medicine inventory, and supplier relationships using advanced data structures and algorithms.

#### Project Description:

The aim of this project is to create an integrated system that optimizes the operations of a pharmacy by leveraging queues for customer orders, Binary Search Trees (BSTs) for managing the inventory of medicines, and graphs for supplier management. This system will ensure smooth processing of orders, quick search and retrieval of medicine information, and efficient management of supplier relationships.

#### Functional Requirements:

1. **Customer Order Management (Queues)**
   * **Description**: Implement a queue to handle customer orders in a First In, First Out (FIFO) manner.
   * **Features**:
     + **Place New Orders**: Customers can place orders for medicines.
     + **Track and Manage Order Status**: Monitor the status of each order from placement to fulfillment.
     + **Process Orders Sequentially**: Ensure that orders are processed in the order they are received to maintain fairness and orderliness.
   * **Technical Details**:
     + Use a linked list-based queue to manage dynamic order entries.
     + Implement methods for enqueueing new orders, dequeueing fulfilled orders, and viewing the current order queue.
2. **Medicine Inventory Management (Binary Search Trees - BST)**
   * **Description**: Use a BST to manage the inventory of medicines, enabling efficient search, insertion, and deletion operations.
   * **Features**:
     + **Insert New Medicines into the Inventory**: Add new medicine records to the inventory.
     + **Delete Medicines that are Out of Stock or Expired**: Remove outdated or unavailable medicines.
     + **Search for Specific Medicines Quickly**: Locate specific medicines using efficient search operations.
   * **Technical Details**:
     + Each node in the BST represents a medicine, storing details like name, quantity, and expiry date.
     + Implement methods for inserting new medicines, deleting medicines, and searching for medicines based on different attributes (e.g., name, category).
3. **Supplier Management (Graphs)**
   * **Description**: Use a graph to model and manage supplier relationships and supply routes.
   * **Features**:
     + **Represent Suppliers as Nodes and Supply Routes as Edges**: Create a visual and logical representation of supplier relationships.
     + **Use Graph Traversal Algorithms to Find the Shortest Supply Paths**: Optimize supply chain logistics by finding the most efficient routes.
     + **Manage and Update Supplier Information and Relationships**: Maintain up-to-date information on suppliers and their connections.
   * **Technical Details**:
     + Implement the graph using adjacency lists or matrices.
     + Use algorithms like Dijkstra’s or Bellman-Ford to find shortest paths and optimize delivery routes.
     + Provide methods to add new suppliers, remove existing suppliers, and update routes.
4. **Prescription History Management (Doubly Linked Lists)**
   * **Description**: Use doubly linked lists to store and manage the prescription history of patients.
   * **Features**:
     + **Store Detailed Prescription Records**: Keep a comprehensive record of prescriptions issued to patients.
     + **Allow Easy Traversal in Both Directions**: Facilitate efficient access and updates of prescription records.
   * **Technical Details**:
     + Each node in the doubly linked list represents a prescription, containing details like patient ID, medicine name, dosage, and date issued.
     + Implement methods to add new prescriptions, delete old prescriptions, and search for prescriptions by patient ID or date.
5. **Sorting Algorithms for Pharmacy Management System**
   * **Description**: Sorting is crucial for displaying and managing records in a structured manner.
   * **Customer Orders**:
     + **Sorting Orders by Priority**: Use Bubble Sort or Selection Sort for simplicity if needed.
   * **Medicine Inventory**:
     + **Sort by Expiry Date**:
       - Use Merge Sort for large datasets due to its efficiency and stability.
       - Use Quick Sort for smaller inventories.
   * **Supplier Relationships**:
     + **Sort by Supply Route Cost**: Use Heap Sort for prioritized route costs.
   * **Prescription History**:
     + **Sort by Date**: Implement Insertion Sort for sorted insertion into the doubly linked list.
6. **Hash Table for Customer Records**
   * **Structure**:
     + **Key**: Customer ID
     + **Value**: Customer details (name, contact info, order history)
   * **Hash Function**:
     + A modular hash function key % table\_size.
   * **Collision Handling**:
     + Chaining: Use linked lists to handle multiple entries for the same hash index.
   * **Operations**:
     + Insert new customers.
     + Search for customer records by ID.
     + Update customer information.