

Restaurant Ordering & Billing System

Course Information

- **University:** Cairo University - Faculty of Computers and Artificial Intelligence
- **Course:** Advanced Software Engineering 2025
- **Team:** [Anton] & [Hatem]
- **TA:** [Ta Marwa] or Mostafa

Design Patterns Implemented

1. **Facade Pattern** - RestaurantFacade.java provides unified interface for ordering workflow
2. **Abstract Factory Pattern** - Creates menu families (Vegetarian, Non-Vegetarian, Kids)
3. **Factory Method Pattern** - Creates specific items (Italian Pizza, Eastern Pizza, Burgers)
4. **Decorator Pattern** - Adds customizable add-ons to menu items
5. **Observer Pattern** - Notifies kitchen and waiter when orders are placed
6. **Strategy Pattern (Payment)** - Supports Cash, Card, and Mobile Wallet payments
7. **Strategy Pattern (Discount)** - Applies category-based discounts

For detailed design rationale, see `src/DOCUMENTATION.txt`

Project Structure

```
src/
├── Main.java
├── DOCUMENTATION.txt
└── model/                               (MenuItem interface + base classes)
    ├── factory/
    │   ├── abstractfactory/             (3 menu factories)
    │   └── factorymethod/            (Pizza & Burger factories)
    ├── decorator/                  (5 add-on decorators)
    ├── observer/                   (Kitchen & Waiter notification)
    ├── facade/                     (RestaurantFacade)
    ├── billing/                    (BillingService, Bill, TaxCalculator)
    └── Strategy/
        ├── payment/                (3 payment strategies)
        └── discount/              (4 discount strategies + factory)
```

How to Run the Project

Prerequisites

- Java JDK 8 or higher

Compilation

```
cd src  
javac Main.java
```

Execution

```
java Main
```

Example Test Cases

Test Case 1: Pizza Order with Customization & Discount

Scenario: Order 2 Italian Margherita pizzas with add-ons

Input:

```
1 (Dine-in)  
2 (Order Pizza)  
1 (Italian Pizza)  
Margherita  
1 (Extra Cheese)  
2 (Mushrooms)  
6 (Done customizing)  
2 (Quantity: 2)  
4 (Finish Order)  
1 (Cash Payment)
```

Expected Output:

```
Items: Italian Margherita Pizza, Extra Cheese, Mushrooms × 2  
Subtotal: $260.00 (Base: $95, +$15 cheese, +$20 mushrooms = $130 × 2)  
Discount: -$26.00 (10% Pizza Discount applied)  
Tax (14%): $32.76  
Total: $266.76  
Kitchen & Waiter notified
```

Test Case 2: Meat Order with Fixed Discount

Scenario: Order 2 Beef Burgers

Input:

```
1 (Dine-in)
3 (Order Burger)
Beef
6 (No add-ons)
2 (Quantity: 2)
4 (Finish Order)
2 (Card Payment)
4111111111111111 (Card number)
```

Expected Output:

```
Items: Classic Beef Burger × 2
Subtotal: $220.00 ($110 × 2)
Discount: -$14.00 ($7 per Meat item × 2)
Tax (14%): $28.84
Total: $234.84
Payment via Credit Card
```

Test Case 3: No Discount Scenario

Scenario: Order desserts and beverages (no eligible discount category)

Input:

```
1 (Dine-in)
1 (Browse Menu Families)
3 (Kids Menu)
3 (Dessert)
6 (No add-ons)
2 (Quantity: 2)
1 (Browse Menu Families)
3 (Kids Menu)
4 (Beverage)
6 (No add-ons)
1 (Quantity: 1)
4 (Finish Order)
1 (Cash Payment)
```

Expected Output:

Items: Ice Cream Sundae × 2, Chocolate Milk × 1
 Subtotal: \$88.00 ($\$35 \times 2 + \18×1)
 Discount: \$0.00 (No Discount applied)
 Tax (14%): \$12.32
 Total: \$100.32

Discount Scenarios

Available Discount Strategies

The system automatically selects the best discount based on order contents (Priority-based):

Priority	Category	Discount Type	Discount Amount
1 (Highest)	Pizza	Percentage	10% off pizza items
2	Chicken	Percentage	8% off chicken items
3	Meat	Fixed	\$7.00 off per meat item
4 (Default)	Other	None	No discount

Discount Examples

1. Pizza Discount (10%)

- Order contains: Pizza items
- Calculation: 10% of total pizza price
- Example: \$200 pizza → \$20 discount

2. Chicken Discount (8%)

- Order contains: Chicken items (no pizza)
- Calculation: 8% of total chicken price
- Example: \$150 chicken → \$12 discount

3. Meat Discount (\$7/item)

- Order contains: Meat items (no pizza/chicken)
- Calculation: \$7 fixed per meat item
- Example: 3 beef burgers → \$21 discount ($\7×3)

4. No Discount

- Order contains: Only desserts/beverages/veggie items
- No discount applied

Priority Rule

If an order contains multiple categories, only the **highest priority** discount applies:

- Pizza + Chicken → Pizza discount (10%)
- Chicken + Meat → Chicken discount (8%)
- Meat only → Meat discount (\$7/item)