**KING KHALID UNIVERSITY**
**COLLEGE Of COMPUTER SCIENCE**
**PROJECT REPORT**
**222CCS-4, OOP**

*Please Use Times New Roman, 11pt*
*Fill out all white black fields*

## 1. STUDENT INFORMATION

| Name | ID | Section | |
|---|---|---|---|
| | | Lab | Theory |
| Munther Mohammed Algarni | 444815993 | 381 | 330 |

## 2. PROJECT INFORMATION

| | | |
|---|---|---|
| Title | | |
| Code Links | | Qrcode |
| Source Code | https://github.com/Munther5/OOP-LAB-PROJECT-2 | |
| Executable Code | https://github.com/Munther5/OOP-LAB-PROJECT-2 | |
| Approximation of total number of hours spent to complete the project | | 7 hours |
| Project Due Date | 16 / 3 / 2025 | Submission Date: 13 / 3 / 2025 |

*Please Use Times New Roman, 11pt*
*Fill out all white black fields*

## 3. PERSONAL REFLECTION & Self-ASSESSMENT

Summarize the project idea and changes you added to the project:

The project initially supported only **KM/L** for fuel consumption calculations. In this phase, we implemented the **Strategy Pattern** to allow dynamic selection between **KM/L, MPG, L/100KM, and GPM**. Instead of modifying the core Fuel2 class, we created an **interface (FuelConsumptionStrategy)** and multiple strategy classes (MilesPerGallonStrategy, LitersPer100KmStrategy, KmPerLiterStrategy, GallonsPerMileStrategy). This improved flexibility and maintainability.

After finishing, any New Concepts learned, or confidence of JAVA has increased in:

1. Strategy Pattern for dynamic method selection.
2. Interfaces & Polymorphism to separate concerns.
3. Code Reusability & Flexibility by minimizing core class changes.
4. Java Method Overriding & Encapsulation for structured OOP design.

Challenges Faced and Solutions, especially if you submit late:

1. Understanding Strategy Pattern: Initially attempted to add multiple methods in Fuel2, but later used an interface-based approach.
2. Refactoring Code: Ensured minimal changes to Fuel2 while integrating new strategies.
3. Output Formatting Issues: Adjusted printReport() for consistent alignment.
4. Debugging Logical Errors: Verified formulas and test cases for accuracy.

*Please Use Times New Roman, 11pt*
*Fill out all white black fields*

4. Important TESTING AND DEBUGGING Cases (ignore if you used testing tool)

| # | Test Case / Error | Correct Output | Actual Output | Date/Time | Passed ? | Note |
|---|---|---|---|---|---|---|
| 1 | Switching between KM/L, MPG, and L/100KM correctly updates the output | Correct calculation based on selected method | Matches expected results | 03/12/2025 02:30 PM | yes | Verified strategy pattern works |
| 2 | Selecting an invalid fuel consumption method | Display error message | Error message displayed | 03/12/2025 04:00 PM | yes | Handled invalid input gracefully |
| ... | GPM (Gallons per Mile) calculation accuracy | Expected GPM =Gallons/Distance | Matches expected result | 03/12/2025 05:45 PM | yes | Formula verified |
| | Ensuring output formatting is aligned correctly | Properly formatted table | Properly formatted table | 03/13/2025 10:15 AM | yes | Formatting verified successfully |
| | Ensuring Fuel2 class does not require modification when adding a new strategy | Works without modifying Fuel2 | Works as expected | 03/13/2025 12:45 PM | yes | Confirmed Strategy Pattern effectiveness |
| | Testing calculate() method when no strategy is set | Should return a default value or error | Returned expected default behavior | 03/13/2025 03:00 PM | yes | No NullPointerException occurred |
| | Testing calculate() method when no strategy is set | No overflow, correct calculation | Works correctly | 03/13/2025 09:30 PM | yes | Ensured system handles large values |

*Please Use Times New Roman, 11pt*
*Fill out all white black fields*

## 5. COLLABORATION AND RESOURCES

If you received help from any classmates, please provide their names and IDs. This information won't be used against you, but will help in cases where reports are similar. It won't be considered fraud if accompanied by explanations.

If you utilized any external tools (e.g., AI, websites), please specify

| Name of the tool | Nature of assistance received |
|---|---|
| 1. ChatGPT (AI) | Assisted in understanding Strategy Pattern, debugging, and structuring the project effectively. |
| | |
| | |

Steps taken to understand and integrate it into your learning

1. Applied Strategy Pattern step by step in the project while minimizing modifications to Fuel2.
2. Verified AI-generated suggestions through manual testing and debugging.
3. Cross-checked implementation with project requirements to ensure correctness.
4. Used trial and error to refine the approach and improve code efficiency.

*Please Use Times New Roman, 11pt*
*Fill out all white black fields*

| EVALUATION (to be filled-out by lab instructors only) | | | |
|---|---|---|---|
| Name | Date | Total Marks<br>100% (5) | Signature |
| | | | |
| Coding<br>40% (2) | Presentation / Demo<br>30% (1.5) | Logistics<br>10% (0.5) | Report<br>20% (1) |
| | | | |

**Notes**