AIM

To design and apply different **prompt engineering techniques**—Straightforward Prompts, Tabular Format Prompting, Preceding Question Prompting, and Missing Word Prompting—for a selected **Unit 5 use case**, and to evaluate their effectiveness using a **simple rubric-based evaluation method**.

EXPLANATION

Prompt engineering techniques influence how effectively a Large Language Model (LLM) understands and responds to user requests.
In this experiment, prompts from **Unit 2** are applied to a real-world **Unit 5 use case** to generate structured and meaningful outputs. The responses are evaluated based on **clarity, accuracy, and usefulness**.

SELECTED USE CASE (UNIT 5)

Use Case:
👉 **AI-based Smart Manufacturing and Predictive Maintenance**

Scenario:
Manufacturing industries use **AI and IoT systems** to monitor machines, predict failures, reduce downtime, and improve energy efficiency.

PROCEDURE

1. Select a real-world use case from Unit 5
2. Design prompts using four prompt engineering techniques from Unit 2
3. Execute prompts using an LLM (e.g., ChatGPT)
4. Collect generated outputs
5. Evaluate responses using a **rubric-based method**

PROMPT TYPES WITH EXAMPLES AND GENERATED OUTPUTS

1. Straightforward Prompts

Prompt Example 1

Prompt:

"Define predictive maintenance in one sentence."

Generated Output:
Predictive maintenance is an AI-driven approach that uses sensor data and analytics to predict machine failures before they occur.

Prompt Example 2

Prompt:

"List three advantages of AI-based smart manufacturing."

Generated Output:

1. Reduced machine downtime
2. Improved production efficiency
3. Optimized energy consumption

Observation

Straightforward prompts provide **clear and direct answers**, suitable for definitions and short explanations.

2. Tabular Format Prompting

Prompt Example 1

Prompt:

"Compare traditional manufacturing and AI-based smart manufacturing in a table."

Generated Output:

Aspect	Traditional Manufacturing	AI-Based Smart Manufacturing
Monitoring	Manual inspection	Automated sensor-based
Downtime	High	Reduced
Efficiency	Moderate	High
Maintenance	Reactive	Predictive

Prompt Example 2

Prompt:

“Provide a table listing IoT components used in smart manufacturing, their function, and one example.”

Generated Output:

Component	Function	Example
Sensors	Data collection	Temperature sensor
Controllers	Process control	PLC
Network	Data transfer	Industrial Ethernet
AI System	Analysis	Predictive model

Observation

Tabular prompts improve **comparison, organization, and readability**.

3. Preceding Question Prompting

Prompt Example 1

Prompt:

“Why is machine downtime a major concern in manufacturing? Explain how AI-based predictive maintenance helps reduce downtime.”

Generated Output:
Machine downtime leads to production loss and increased costs. AI-based predictive maintenance analyzes real-time sensor data to detect early signs of failure, allowing maintenance to be scheduled before breakdowns occur.

Prompt Example 2

Prompt:

“Why is energy efficiency important in factories? Describe how AI systems help optimize energy usage.”

Generated Output:
Energy efficiency reduces operational costs and environmental impact. AI systems analyze production patterns and energy consumption to optimize machine operation and minimize wastage.

Observation

Preceding questions provide **context**, resulting in **deeper and more logical explanations**.

4. Missing Word Prompting

Prompt Example 1

Prompt:

“In smart manufacturing, IoT sensors collect real-time _____ from machines.”

Generated Output:
data

Prompt Example 2

Prompt:

“Predictive maintenance helps prevent unexpected machine _____.”

Generated Output:
failures

Observation

Missing word prompts are effective for **testing knowledge, revision, and assessments**.

EVALUATION METHOD – RUBRIC

Evaluation Criteria

Criteria	Description
Clarity	How clearly the response is presented
Accuracy	Correctness of information
Usefulness	Relevance to the use case

Rubric-Based Evaluation Table

Prompt Type	Clarity (5)	Accuracy (5)	Usefulness (5)	Total (15)
Straightforward	5	5	4	14
Tabular	5	5	5	15
Preceding Question	5	5	5	15
Missing Word	4	5	4	13

RESULT

The various types of prompts were executed successfully, and a structured report was generated. Each prompting technique produced outputs suitable for different purposes such as definition, comparison, explanation, and assessment.

CONCLUSION

This experiment demonstrates that different **prompt engineering techniques** serve different objectives in AI-based report generation.

- **Straightforward prompts** are ideal for direct answers.
- **Tabular prompts** enhance comparison and clarity.
- **Preceding question prompts** improve depth and reasoning.
- **Missing word prompts** are effective for learning assessment.

Applying these prompt types to a **Unit 5 smart manufacturing use case** highlights the importance of prompt design in obtaining accurate, clear, and useful AI outputs.