PROMPT ENGINEERING FOR GENERATIVE AI

Course Code	23CS6601	Year	III	Semester	II
Course Category	Honors	Branch	CSE	Course Type	Theory
Credits	3	L-T-P	3-0-0	Prerequisites	Artificial Intelligence, Machine Learning, Deep learning
Continuous Internal Evaluation	30	Semester End Evaluation	70	Total Marks	100

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	**Understand** the foundational concepts, role, and importance of prompt engineering in generative AI systems.	L2
CO2	**Apply** principles of effective prompt design and structure to generate desired outputs from LLMs.	L3
CO3	**Apply** optimized prompts across domains using advanced techniques like role-based prompting and prompt chaining.	L3
CO4	**Apply p**rompt performance using quantitative and qualitative metrics to enhance AI output quality.	L3

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1		√											√
CO2		√											
CO3			√										
CO4				√									
Avg.													

Syllabus		
Unit No	Contents	Mapped CO
I	**Understanding Language Model:** Behaviour, Tokenization, Input-output relationships in language models, Understanding model capabilities and limitations, Token economics and computational considerations. **Fundamentals of Prompt Engineering:** Definition and scope of prompt engineering, Core Components**:** instructions, context	CO1
II	**Prompt Structure and Design Principles:** Instruction clarity, specificity, and precision, Context setting and background information provision, Output format specification and structured responses, Constraint definition and boundary setting techniques	CO2

	Core Prompting Techniques: Zero-shot prompting, Few-shot prompting, Template-based prompting, Role-based and persona prompting	
III	**Chain-of-Thought (CoT) Prompting**: Fundamentals of step-by-step reasoning, Designing effective CoT prompts, Variations: zero-shot CoT, few-shot C **Advanced Reasoning Techniques:** Tree of Thoughts: exploring multiple reasoning paths, multi-path reasoning and decision trees,	CO3
IV	**Optimization Techniques and Testing:** Prompt testing and iterative refinement, A/B testing methodologies and statistical significance, Automated evaluation techniques and tools, Performance monitoring and continuous improvement, Parameter tuning: temperature, top-p, and generation controls **Evaluation Metrics:** Quantitative evaluation: accuracy, relevance, coherence, consistency, Qualitative assessment and human evaluation methods,	CO4
V	**Software Development Applications:** Code generation and completion prompts, Debugging assistance. **Data Analysis and Research Applications**: Data exploration and analysis prompts, Research assistance and literature review automation, Statistical analysis and interpretation, Report generation and summarization, Scientific writing.	CO3, CO4

Learning Resources

Text Books

1. "The Art of Prompt Engineering: Mastering Communication with AI Models ", Sarah Chen and Michael Rodriguez 2024.
2. "Prompt Engineering for Large Language Models: The Art and Science of Building Large Language Model-Based Application " , John Berryman and Albert Ziegler,I edition,2024, O'Reilly Media

References

1. Advanced Prompt Engineering: An in-depth manual for advanced A. I. practitioners on designing, optimizing, and operationalizing prompts with code-driven workflow Kindle Edition by Gurudath Sadanandan
2. Hands-On Large Language Models: Language Understanding and Generation 1st Edition by Jay Alammar, Maarten Grootendorst
3. Prompt Engineering and Generative Ai Applications for Teaching and Learning by Areej Elsayar, Information Science Reference
4. Mastering Prompt Engineering: Deep Insights for Optimizing Large Language Models (LLMs) 1st Edition
5. by Anand Nayyar., Ajantha Devi Vairamani.,
6. The Secret of Prompt Engineering: Master the Skill That Can Earn You $350,000 by Amenda Hawkins , Shehzad Quresh

E-Recourses and other Digital Material

1. https://platform.openai.com/docs/guides/prompt-engineering
2. https://docs.anthropic.com/en/docs/build-with-claude/prompt-engineering/overview
3. https://ai.google.dev/gemini-api/docs/prompting-strategies
4. https://huggingface.co/docs/transformers/en/tasks/prompting
5. https://github.com/dair-ai/Prompt-Engineering-Guide