PVP 20

PRASAD V. POTLURI SIDDHARTHA INSTITUTE OF TECHNOLOGY

(Autonomous)

Kannur, Vijayawada-520007

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING (Data Science)

IV B Tech – I Semester

Prompt Engineering and Generative AI Systems

Course Code	**20SA8757**	**Year**	IV	**Semester**	I
Course Category	SO	**Branch**	CSE (Data Science)	**Course Type**	Practical
Credits	2	**L-T-P**	1-0-2	**Prerequisites**	ML, DL, NLP
Continuous Internal Evaluation	15	**Semester End Evaluation**	35	**Total Marks**	50

Course Outcomes		
Upon Successful completion of course, the student will be able to		
CO1	Demonstrate the experimental procedures and underlying principles of prompt engineering and generative AI through oral presentations and comprehensive documentation reports.	**L2**
CO2	Use prompt engineering strategies such as zero-shot, few-shot, persona-based, and chain-of-thought prompting to develop intelligent solutions for tasks including text generation, summarization, code generation, and classification using tool.	**L3**
CO3	Apply generative AI architectures such as Autoencoders, VAEs, BERT, GPT, and Diffusion Models to build and evaluate models for tasks in vision and language domains using tools.	**L3**
CO4	Analyze the effectiveness, relevance, and performance of different prompting techniques and generative models across tasks by comparing human and automatic evaluation metrics.	**L4**
CO5	Design and evaluate intelligent systems that integrate prompt engineering techniques with generative AI models for solving domain-specific problems in real-world contexts.	**L5**

Contribution of Course Outcomes towards achievement of Program Outcome & Strength of correlation (3: High, 2: Medium, 1: Low)

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PSO1**	**PSO2**
CO1	2								2				
CO2	3				3						2	3	
CO3	3				3						2	3	
CO4		3									2		3
CO5				3							2		3

Syllabus		
Exp. No.	**Contents**	**Mapped CO**
Part A: Prompt Engineering		
1	Design and evaluate zero-shot and few-shot prompts for text classification tasks (sentiment analysis, spam detection, topic classification) using large language models.	CO1, CO2, CO4, CO5
2	Create prompts that simulate expert behaviour using role-based and persona prompting techniques to analyse how roles affect response style and specificity.	CO1, CO2, CO4, CO5
3	Design prompts for mathematical and logical reasoning problems using advanced reasoning strategies and compare response depth and correctness.	CO1, CO2, CO4, CO5
4	Generate multiple prompt versions for the same task and measure effectiveness using both human and automatic metrics.	CO1,CO2, CO4,CO5
5	Use prompt engineering to automatically generate function documentation, comments, and test cases from raw code snippets.	CO1, CO2, CO4,CO5
6	**Mini Project:** Intelligent Prompt-Driven Assistant for Domain-Specific Applications Design and develop a prompt-driven intelligent assistant that leverages large language models (LLMs) to perform tasks within a chosen domain (such as education, healthcare, legal, software development, marketing, or customer service). The system should accept structured or unstructured user inputs and use tailored prompting techniques (zero-shot, few-shot, persona-based, or chain-of-thought) to generate relevant, context-aware outputs. The application must incorporate the following core functionalities: • Prompt design interface or predefined templates for interacting with the LLM. • Dynamic context handling (e.g., user roles, task types, or objectives). • Output generation and display, possibly including summaries, recommendations, completions, explanations, or reports. • Optional prompt evaluation, refinement, or A/B testing mechanism. Students are encouraged to: • Select their own application domain. • Customize prompting techniques and response evaluation metrics. • Implement relevant ethical and safety checks (e.g., avoiding hallucinations, biased content, or adversarial use).	CO1, CO2, CO4,CO5
Part B: Gen AI		
7	Implement an AutoEncoder and Variational AutoEncoder (VAE) using a deep learning framework (such as TensorFlow or PyTorch) and evaluate their performance on image reconstruction tasks using MNIST or CIFAR-10 datasets.	CO1, CO3, CO4, CO5
8	Build and fine-tune a pre-trained BERT model for a sentiment analysis task using Hugging Face Transformers and evaluate its performance using classification metrics (Accuracy, F1-score).	CO1, CO3, CO4, CO5

9	Design and train a text generation model using GPT-2, and generate contextually relevant outputs for given prompts. Experiment with different temperature and top-k sampling settings.	CO1, CO3, CO4, CO5
10	Compare Vision Transformer (ViT) and CNN on an image classification task. Analyze the architectural differences and performance metrics (accuracy, inference time).	CO1, CO3, CO4, CO5
11	Use a pre-trained Diffusion model (e.g., DALL•E or Stable Diffusion) to generate images from textual prompts and analyze the quality of outputs using FID or subjective human evaluation.	CO1, CO3, CO4, CO5
12	**Mini Project:** Multimodal Content Generation using Generative AI Models Design and develop a generative AI-based application that utilizes pre-trained models to generate content from one or more modalities (text, image, or code). The system should allow users to provide input prompts (such as text descriptions, keywords, or partial images), and based on these inputs, the system should generate coherent and contextually appropriate outputs. The project must include functionalities such as: • Input interface for prompt or seed content. • Backend integration with generative models (e.g., GPT, BERT, DALL·E, or Stable Diffusion). • Output visualization or rendering interface for generated content. • Optional: feedback collection or regeneration capability for enhanced user control. Students are free to choose the type of content (text completion, image generation, story creation, code synthesis, etc.) and define their own theme or domain (e.g., education, entertainment, marketing, health, etc.).	CO1, CO3, CO4, CO5

Learning Resources

Text Books

1. Prompt Engineering for Large Language Models: Theory and Practice , John Berryman and Albert Ziegler, Ist edition,2024, O'Reilly Media
2. Generative Deep Learning: Teaching Machines to Paint, Write, Compose, and Play, David Foster, 2nd Edition, 2023, O'Reilly Media.

References

1. Conversational AI and Prompt Engineering Fundamentals, OpenAI Research Team,2024
2. Deep Learning, Ian Good fellow, Yoshua Bengio, and Aaron Courville, 2nd Edition, 2016, MIT Press.

E-Recourses and other Digital Material

1. https://huggingface.co
2. https://github.com/openai/openai-cookbook
3. https://github.com/dair-ai/Prompt-Engineering-Guide
4. https://www.deeplearning.ai/courses
5. https://github.com/huggingface/transformers
6. https://promptlayer.com