SBIT TECHMENTORS CURRICULUM GENERATIVE AI: PROMPT ENGINEERING AND APPLICATIONS

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GENERATIVE AI: PROMPT ENGINEERING AND APPLICATIONS

This program offers a comprehensive exploration of generative AI technologies with a specific focus on prompt engineering. It begins with foundational concepts and progresses to advanced techniques, covering a range of applications across creative, educational, healthcare, and business domains. You will be introduced to LLMs and their architectures, and the different types of generative models such as VAEs, GANs, Autoencoders, and Transformer-based models. Through hands-on projects, students will learn to design, optimize, and implement Gen AI prompts to create sophisticated generative AI systems. The course also addresses ethical considerations and equips students with the tools and knowledge to navigate the rapidly evolving landscape of generative AI.

SCHEME

Course Name: Generative AI: Prompt Engineering and Applications

Duration: 9 Months (39 weeks)

S. No.	Paper Title	Lecture / Tutorial (per week)	Practical Classes (per week)	Total Hours (Lecture / Tutorial)	Total Hours (Practical Classes)	Total Credit
1	Foundations of Generative AI	3	10	20	50	3
2	Essentials of Prompt Engineering	3	10	20	50	3
3	Advanced Techniques in Prompt Engineering	4	11	26	68	4
4	Prompt Engineering for Creative Applications	3	10	20	50	3
5	Domain-Specific Applications of Prompt Engineering	3	10	20	50	3
6	Tools and Platforms for Prompt Engineering	3	10	26	38	3
7	Capstone Project	1	5	18	144	6
Total				**150**	**450**	**25**

PROGRAM OUTCOMES

- Understand and apply foundational principles of generative AI and distinguish between different types of generative models.
- Craft, optimize, and evaluate AI prompts for various applications, ensuring effective and precise AI responses.
- Implement advanced prompt engineering techniques, including dynamic and contextual prompting, and apply them in real-world scenarios.
- Utilize generative AI in creative fields, such as art, design, and storytelling, while addressing associated ethical challenges.
- Develop domain-specific AI solutions, integrating prompt engineering in healthcare, education, marketing, and business applications.
- Leverage AI tools and platforms to create, test, and deploy generative AI applications, making use of popular APIs and software.
- Design and complete a capstone project, demonstrating the practical application of learned skills in a chosen area of interest.

LEARNING PATH VISUALIZATION

1) Foundations of Generative AI
2) Essentials of Prompt Engineering
3) Advanced Techniques in Prompt Engineering
4) Prompt Engineering for Creative Applications
5) Domain-Specific Applications of Prompt Engineering
6) Tools and Platforms for Prompt Engineering
7) Capstone Project

MODULE 1: FOUNDATIONS OF GENERATIVE AI

LEARNING OUTCOMES:

- Understand the basic concepts and history of generative AI, including the difference between generative and discriminative models.
- Identify and differentiate between various types of generative models like GANs, VAEs, and diffusion models.
- Recognize the wide range of applications for generative AI in industries such as content creation, design, and data augmentation.
- Critically assess the ethical challenges associated with generative AI, including issues of bias, fairness, and ethical implications.

TOPICS COVERED:

- Introduction to Generative AI
    - Overview and history
    - Key concepts: Generative vs. Discriminative models
- Types of Generative Models
    - GANs (Generative Adversarial Networks)

- VAEs (Variational Autoencoders)
  - Diffusion models
- Real-world Applications
  - Content creation (text, images, music)
  - Data augmentation
  - Design and art
- Ethics and Challenges
  - AI biases and fairness
  - Ethical considerations in generative AI

MODULE 2: ESSENTIALS OF PROMPT ENGINEERING

LEARNING OUTCOMES:

- Comprehend the role of prompts in AI systems, understanding the differences between natural language and symbolic prompts.
- Develop the ability to craft effective and precise prompts, balancing specificity and flexibility to achieve desired AI outputs.
- Apply optimization techniques to refine prompts, using iterative approaches to enhance AI response quality.
- Evaluate prompt performance using relevant metrics and draw lessons from case studies on successful prompt engineering.

TOPICS COVERED:

- Understanding Prompts
  - Definition and significance in AI
  - Natural language prompts vs. symbolic prompts
- Crafting Effective Prompts
  - Techniques for clarity and precision
  - Balancing specificity and flexibility
- Prompt Optimization Strategies
  - Iterative prompt refinement
  - Techniques for tuning prompts for desired outcomes
- Evaluating Prompt Performance
  - Metrics for assessing effectiveness
  - Case studies on successful prompts

MODULE 3: ADVANCED TECHNIQUES IN PROMPT ENGINEERING

LEARNING OUTCOMES:

- Master contextual and adaptive prompting techniques, incorporating relevant context to improve AI-generated responses.
- Implement dynamic prompting strategies, including real-time adjustments and the use of external data sources.

- Design complex multi-step and chained prompts for advanced AI applications, understanding how to sequence prompts effectively.
- Utilize zero-shot, few-shot, and multi-shot learning techniques to engineer prompts that work well with minimal data input.

TOPICS COVERED:

- Contextual and Adaptive Prompting
  - Incorporating context for better AI responses using RAG architecture
  - Techniques for handling ambiguous or complex prompts
- Dynamic Prompting
  - Adjusting prompts in real-time
  - Leveraging external data sources in prompts
- Multi-step and Chained Prompts
  - Designing sequences of prompts for complex tasks
  - Examples of successful prompt chains
- Zero-shot, Few-shot, and Multi-shot Learning
  - Leveraging minimal data for prompt engineering
  - Practical applications in AI tasks

MODULE 4: PROMPT ENGINEERING FOR CREATIVE APPLICATIONS

LEARNING OUTCOMES:

- Explore the use of AI in creative domains, such as art, design, and interactive storytelling, and understand its impact on creativity.
- Develop AI-driven content generation systems, including automated tools for writing, image creation, and other media.
- Integrate AI prompts into interactive storytelling and gaming environments, balancing user input with AI-generated content.
- Critically analyze ethical issues related to AI-generated creative work, including concerns about copyright, ownership, and originality.

TOPICS COVERED:

- AI in Art and Design
  - Generating creative content: images, music, and stories
  - Enhancing creativity through AI tools
- Content Generation
  - Automating the creation of articles, blogs, and social media posts
  - Techniques for maintaining style and coherence
- Interactive Storytelling and Games
  - Using prompts to drive narratives in games and interactive media
  - Balancing user input and AI-generated content
- Ethical Considerations in Creative AI
  - Copyright, ownership, and originality
  - Navigating ethical dilemmas in AI-generated art

MODULE 5: DOMAIN-SPECIFIC APPLICATIONS OF PROMPT ENGINEERING

LEARNING OUTCOMES:

- Apply prompt engineering techniques in healthcare, education, marketing, and other domains, understanding the specific needs of each field.
- Design AI-driven tools for personalized education and training, leveraging prompts to create tailored learning experiences.
- Automate customer service and marketing interactions using AI prompts, enhancing user experience and engagement.
- Explore the application of generative AI in business and finance, using prompts to generate insights and support decision-making.

TOPICS COVERED:

- Healthcare
  - AI prompts for medical diagnosis and decision support
  - Enhancing patient interaction through AI
- Education and Training
  - Developing AI-driven educational tools
  - Personalizing learning experiences using prompts
- Marketing and Customer Service
  - Automating customer interactions with AI prompts
  - Personalizing marketing campaigns and content
- Business and Finance
  - AI-driven insights for financial analysis
  - Automating business decision-making processes

MODULE 6: TOOLS AND PLATFORMS FOR PROMPT ENGINEERING

LEARNING OUTCOMES:

- Gain proficiency with key AI platforms and tools used in prompt engineering, such as OpenAI and Hugging Face.
- Utilize specific tools for creating, testing, and optimizing prompts, comparing the capabilities of different platforms.
- Integrate AI APIs into applications, effectively leveraging generative AI capabilities in real-world scenarios.
- Analyze case studies of tool-based implementations, learning from successful applications of AI platforms.

TOPICS COVERED:

- Overview of AI Platforms
  - Key platforms for generative AI: OpenAI, Hugging Face, etc.
- Prompt Engineering Tools
  - Exploring tools for creating and testing prompts like langchain

    - Comparing platform-specific prompt capabilities
- API Integrations
    - Leveraging AI APIs for prompt-driven applications
    - Hands-on with popular AI APIs like Microsoft Agent framework
- Case Studies: Tool-Based Implementations
    - Examples of successful applications using AI platforms

MODULE 7: CAPSTONE PROJECT

LEARNING OUTCOMES:

- Design and implement a generative AI project from start to finish, applying prompt engineering techniques learned throughout the course.
- Evaluate the effectiveness and user experience of AI-driven applications, using feedback to refine and improve your project.
- Analyze a real-world case study of generative AI in industry, identifying key success factors and potential pitfalls.

TOPICS COVERED:

- Building a Content Creation AI
    - Designing and optimizing prompts for a writing assistant
    - Testing and refining the final product
- AI in Education
    - Creating an AI-powered tutoring system
    - Evaluating its effectiveness and user experience
- Gen AI in Software Development
    - Use of prompt engineering and other Gen AI tools to optimize various activities in software development
    - Generating source code and test cases

ATTENDANCE AND EVALUATION

Attendance: 75% of all mandatory classes/mini projects

Evaluation: Score from assignments, mini-projects, online quiz (20 min tests every week), and a final exam.

Evaluation Scheme

Assessment Type	Total Count	Best of	Points / Assessment	Total Points
Quizzes	24	22	5	110
Lab Assignments	24	20	3	60
Mini Projects	24	23	10	230
Final Exams	6	6	100	600
Capstone	1	1	400	400
			Total	1400

Grading Scheme

Letter Grade	Percentage Range
A+	90% - 100%
A	70% - 89%
B+	50% - 69%
B	40% - 49%
C	0% - 40%

Certificate of Completion Criteria:

- Secure more than **40% marks** overall
- Maintain at least **75% attendance** as per the policy

Certificate of Participation Criteria:

- Secure less than **40% marks** overall
- Maintain at least **50% attendance** as per the policy

C Grade: Only participation certificate

Capstone evaluation: Based on the final presentation during the campus visit/online session.