Introduction to AI and Applications		Semester	I/II
Course Code	**1BAIA103/203**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40	Total Marks	100
Credits	3	Exam Hours	3
Examination type (SEE)	Theory		

Course outcome (Course Skill Set)

At the end of the course, the student will be able to:

CO1: Explain the concepts and types of artificial intelligence.
CO2: Illustrate basic machine learning methods for regression, classification and clustering.
CO3: Identify real-world applications across different disciplines.
CO4: Make use of prompt engineering techniques to interact with generative AI tools.
CO5: Outline recent trends in artificial intelligence and machine learning.

Module-1

Introduction to Artificial Intelligence: Artificial Intelligence, How Does AI Work?, Advantages and Disadvantages of Artificial Intelligence, History of Artificial Intelligence, Types of Artificial Intelligence, Weak AI, Strong AI, Reactive Machines, Limited Memory, Theory of Mind, Self-Awareness, Is Artificial Intelligence Same as Augmented Intelligence and Cognitive Computing, Machine Learning and Deep Learning.

Machine Intelligence: Defining Intelligence, Components of Intelligence, Differences Between Human and Machine Intelligence, Agent and Environment, Search, Uninformed Search Algorithms, Informed Search Algorithms: Pure Heuristic Search, Best-First Search Algorithm (Greedy Search).

Knowledge Representation: Introduction, Knowledge Representation, Knowledge-Based Agent, Types of Knowledge.

Textbook 1: Chapter 1 (1.1-1.5), Chapter 3 (3.1-3.7.2), Chapter 4 (4.1-4.4)

Number of Hours: 08

Module-2

Introduction to Prompt Engineering, Introduction to Prompt Engineering, The Evolution of Prompt Engineering, Types of Prompts, How Does Prompt Engineering Work?, Comprehending Prompt Engineering's Function in Communication, The Advantages of Prompt Engineering, The Future of LLM Communication.

Prompt Engineering Techniques for ChatGPT, Introduction to Prompt Engineering Techniques, Instructions Prompt Technique, Zero, One, and Few Shot Prompting, Self-Consistency Prompt.

Prompts for Creative Thinking: Introduction, Unlocking Imagination and Innovation.

Prompts for Effective Writing: Introduction, Igniting the Writing Process with Prompts.

Textbook 2: Chapters 1, 3, 4 & 5 Number of Hours: 08

Module-3

Machine Learning: Techniques in AI, Machine Learning Model, Regression Analysis in Machine Learning, Classification Techniques, Clustering Techniques, Naïve Bayes Classification, Neural Network, Support Vector Machine (SVM).

Textbook 1: Chapter 2 (2.1-2.8) Number of Hours: 08

Module-4

Trends in AI: AI and Ethical Concerns, AI as a Service (AIaaS), Recent trends in AI, Expert System, Internet of Things, Artificial Intelligence of Things (AIoT).

Textbook 1: Chapter 8 (8.1, 8.2, 8.4), Chapter 9 (9.1- 9.3) Number of Hours: 08

Module-5

Robotics, Robotics-an Application of AI, Drones Using AI, No Code AI, Low Code AI.

Textbook 1: Chapter 8 (8.3), Chapter 1 (1.7, 1.8, 1.10, 1.11)

Industrial Applications of AI: Application of AI in Healthcare, Application of AI in Finance, Application of AI in Retail, Application of AI in Agriculture, Application of AI in Education, Application of AI in Transportation, AI in Experimentation and Multi-disciplinary research.

Textbook 3: Chapter 3, Chapter 5 (5.1)

Number of Hours: 08

Suggested Learning Resources: (Textbook/ Reference Book/ Manuals):

Textbooks:

1. Reema Thareja, Artificial Intelligence: Beyond Classical AI, Pearson Education, 2023.
2. Ajantha Devi Vairamani and Anand Nayyar, Prompt Engineering: Empowering Communication, 1st Edition, CRC Press, Taylor & Francis Group, 2024. (DOI: https://doi.org/10.1201/9781032692319).
3. Saptarsi Goswami, Amit Kumar Das and Amlan Chakrabarti, "AI for Everyone – A Beginner's Handbook for Artificial Intelligence", Pearson, 2024.

Reference books / Manuals:

1. Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach* (4th Edition), Pearson Education, 2023.
2. Elaine Rich, Kevin Knight, and Shivashankar B. Nair, *Artificial Intelligence*, McGraw Hill Education.
3. Tom Taulli, *Prompt Engineering for Generative AI: ChatGPT, LLMs, and Beyond*, Apress, Springer Nature.
4. Nilakshi Jain, Artificial Intelligence: Making A System Intelligent, First Edition, Wiley.

Web links and Video Lectures (e-Resources):

1. Elements of AI – *https://www.elementsofai.com*
2. CS50's Introduction to Artificial Intelligence with Python – Harvard *https://cs50.harvard.edu/ai/*
3. Google Machine Learning Crash Course – *https://developers.google.com/machine-learning/crash-course*
4. Learn Prompting (Open-Source Guide) – *https://learnprompting.org*
5. Google AI – Learn with Google AI *https://ai.google/education/*
6. Coursera – Machine Learning by Andrew Ng (Stanford University) *https://www.coursera.org/learn/machine-learning*
7. OpenAI Prompt Engineering Guide (for ChatGPT) *https://platform.openai.com/docs/guides/gpt-best-practices*
8. Prompt Engineering for Developers – DeepLearning.AI + OpenAI *https://www.deeplearning.ai/short-courses/chatgpt-prompt-engineering-for-developers/*
9. Ethics in AI – Google Responsible AI Practices *https://ai.google/responsibilities/responsible-ai-practices/*
10. Google Teachable Machine (Train AI models visually without code) https://teachablemachine.withgoogle.com

Teaching-Learning Process (Innovative Delivery Methods):

The following are sample strategies that educators may adopt to enhance the effectiveness of the teaching-learning process and facilitate the achievement of course outcomes.

- Flipped Classroom
- Problem-Based Learning (PBL)
- Case-Based Teaching

- Simulation and Virtual Labs
- ICT-Enabled Teaching
- Tool Demonstration

Assessment Structure:

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage.

- To qualify and become eligible to appear for SEE, in the **CIE**, a student must score at least **40% of 50 marks**, i.e., **20 marks**.
- To pass the **SEE**, a student must score at least **35% of 50 marks**, i.e., **18 marks**.
- Notwithstanding the above, a student is considered to have **passed the course,** provided the combined total of **CIE and SEE is at least 40 out of 100 marks**.

Continuous Comprehensive Assessments (CCA):

CCA will be conducted for a total of 25 marks. It is recommended to include a maximum of two learning activities aimed at enhancing the holistic development of students. These activities should align with course outcomes and promote higher-order thinking and application-based learning.

Learning Activity -1: Practical Assignment on Creating Effective Prompts (Marks- 25)

INSTRUCTIONS:

1. Students must demonstrate the solutions to the course instructor and submit the record containing prompt creation (procedure), prompt execution and results with observations.
2. Course instructor must evaluate the student performance as per the rubrics.

Sl. No	Activity on Creating Effective Prompts
Note: To conduct the activity students can use any of the AI tools such as ChatGPT.	
1	**Basic Prompt writing:** Create two different prompts to ask an AI about the topic "Electricity." The first prompt should be vague, and the second prompt should be clear and specific. Compare the responses you get and describe which prompt gave a better answer and why.
2	**Zero-Shot Prompting**: Create a prompt that asks an AI to explain Ohm's Law without giving any example or background. Evaluate how well the AI explains the concept based on your prompt alone.
3	**One-Shot and Few-Shot Prompting:** Provide the AI with a single example of how to calculate the resistance in a simple circuit. Then write your own prompt asking the AI to solve a similar resistance calculation. After that, add two more examples to your prompt and observe any changes in the AI's response quality.
4	**Chain-of-Thought Prompting:** Develop a prompt that guides the AI step-by-step through calculating current flow in a circuit using Ohm's Law with resistors in series. Then, ask a final question for the AI to solve. Analyze how breaking down the reasoning steps impacts the accuracy of the answer.
5	**Prompt Refinement:** Start with an ambiguous prompt related to the "Water Cycle." Test the AI's response, note the confusion or errors, and then refine your prompt to make it clearer and more specific. Repeat this process twice and record how the AI's responses improve with each refinement. **Role-Based Prompting:** Create three prompts asking the AI to explain "Newton's Laws of Motion," each with a different role instruction: (a) as an expert engineer, (b) as a high school teacher, (c) as a beginner. Compare the tone, detail, and style of the responses.
6	**Creative Engineering Problem Prompts:** Craft a prompt that asks the AI to brainstorm ideas for designing a low-cost water purification system suitable for rural areas. Encourage creativity by adding phrases like **"limited resources"** and **"sustainability"**.

7	**Ethical Prompt Design Discussion:** Identify a biased prompt related to job descriptions (e.g. language with respect to a gender). Rewrite the prompt to remove bias and create a neutral, inclusive version. Explain why this revision is more ethical.
8	**Simulated Customer Support Chatbot:** Develop a prompt that instructs the AI to play the role of a technical support agent helping a customer troubleshoot a failure in an electronic circuit. Include instructions to keep the tone friendly and professional and to ask diagnostic questions.
9	**Multi-Language Prompting:** Develop a prompt that asks the AI to translate a simple engineering glossary (5 technical terms) from English to your native language. Then modify the prompt to request additional explanations of these terms in the translated language.
10	Review a curated set of different prompt types (e.g., for summarization, information extraction, paraphrasing, question answering) from a "Prompt Gallery." For each prompt type, match it with a real-world task (e.g., summarizing a lecture note, extracting names from a project report). Test at least three prompt templates on an AI tool or by role-play (students simulate being the AI), with varied wording. Record the outcomes and discuss which prompt (or template) was most effective for each task, and explain why you think it worked best. Reflect on how changing small parts of a prompt can alter model response quality, completeness, or accuracy.
11	Choose a real engineering challenge or societal problem relevant to your field (e.g., "Reducing plastic waste in campus cafeterias" or "Optimizing solar panel placement on campus rooftops"). Draft an initial prompt that asks an AI to propose practical solutions. Share the AI's (or peer's) answer in small groups and identify aspects that are missing, vague, or not actionable. Refine your prompt based on feedback (e.g., specify constraints, ask for step-by-step solutions, or require a list of pros and cons). Repeat the process one more time, refining again for further clarity or specificity. Document the entire prompt-refinement process and share the best solution generated, along with a brief analysis of how prompt improvements led to better responses.

Rubrics for Learning Activity (Creating Effective Prompts):

Component & CO-PO Mapping	Outstanding (5)	Exceeds Expectations (4)	Meets Expectations (3)	Needs Improvement (2)	Unsatisfactory (1)
Appropriate Use of Prompting Technique [CO4] [PO1, PO5]	Demonstrates precise and creative application of the intended prompting technique (e.g., zero-shot, few-shot, role-based) with full alignment to objectives.	Correctly applies the prompting technique with minor gaps or missed opportunities.	Uses the prompting technique, but with partial understanding or inconsistent application.	Limited understanding of the technique; incorrect or weak application.	No evidence of correct prompting technique use.
Analysis & Comparison of Responses [CO1] [PO2, PO4]	Provides thorough, insightful, and well-supported analysis of AI responses, comparisons highlight key strengths and weaknesses.	Provides clear analysis with relevant comparisons, though slightly less detailed.	Provides basic analysis with limited insight, comparisons are present but shallow.	Minimal analysis, comparisons are weak or incomplete.	No meaningful analysis or comparison.
Creativity & Problem-Solving [CO3, CO5] [PO3, PO11]	Demonstrates outstanding creativity and innovation in crafting prompts, especially for problem-solving or design tasks.	Demonstrates creativity and some innovation; solutions are practical.	Shows moderate creativity; prompts are functional but not innovative.	Minimal creativity; prompts are repetitive or unimaginative.	No creativity or problem-solving is evident.
Ethical Awareness & Inclusivity [CO-5] [PO7]	Identifies biases clearly and revises prompts to be fully ethical, inclusive, and culturally sensitive.	Identifies some biases and revises prompts to improve inclusivity.	Attempts bias identification, but revisions are incomplete or partly effective.	Minimal effort is made to address bias; inclusivity not fully considered.	No consideration of bias or ethics is used in prompts.
Clarity & Specificity of Prompts, Documentation & Reflection [CO1, CO4] [PO8, PO9, PO11]	Prompts are self-explanatory, specific, and well-structured for the intended activity; no ambiguity is present. Documentation is complete, well-organized, and includes deep reflection on improvements across iterations.	Prompts are clear and mostly specific; minor ambiguity is present. Documentation is complete with some reflection on prompt refinement.	Prompts are somewhat clear but could be more specific; moderate ambiguity. Documentation is present but lacks detail or depth in reflection.	Prompts are vague and lack clarity; high ambiguity. Incomplete documentation, reflection is minimal.	Prompts are unclear, incomplete, or irrelevant to the activity. No documentation or reflection provided as per schedule