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|-----------------------|------------------------------------------------|
| <b>INSTITUTE</b>      | <b>DIPLOMA STUDIES</b>                         |
| <b>PROGRAM</b>        | <b>DIPLOMA ENGINEERING (CIVIL ENGINEERING)</b> |
| <b>SEMESTER</b>       | <b>3</b>                                       |
| <b>COURSE TITLE</b>   | <b>GENERATIVE AI &amp; PROMPT ENGINEERING</b>  |
| <b>COURSE CODE</b>    | <b>09CE0305</b>                                |
| <b>COURSE CREDITS</b> | <b>1</b>                                       |

### Objective:

- 1 To enable students to understand Generative AI concepts and effectively use prompt engineering techniques to perform engineering tasks such as report generation, inspection, maintenance planning, and documentation without requiring programming knowledge.

**Course Outcomes:** After completion of this course, student will be able to:

- 1 Apply the basic working principles of Generative AI to identify suitable engineering applications.
- 2 Use appropriate AI tools to perform specific engineering tasks effectively.
- 3 Construct structured and optimized prompts for solving engineering problems.
- 4 Examine and refine AI-generated outputs to improve correctness and usefulness.
- 5 Develop prompt-based solutions to handle real-world engineering workflows.

**Pre-requisite of course:**NA

### Teaching and Examination Scheme

| <b>Theory Hours</b> | <b>Tutorial Hours</b> | <b>Practical Hours</b> | <b>ESE</b> | <b>IA</b> | <b>CSE</b> | <b>Viva</b> | <b>Term Work</b> |
|---------------------|-----------------------|------------------------|------------|-----------|------------|-------------|------------------|
| 0                   | 0                     | 2                      | 0          | 30        | 20         | 25          | 25               |

| <b>Contents : Unit</b> | <b>Topics</b>                                                                                                                                                                                                                                  | <b>Contact Hours</b> |
|------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1                      | <b>AI IN ENGINEERING PRACTICE</b><br>Basics of Generative AI, AI working principle (prediction concept), AI vs Traditional tools, AI tools overview, Engineering applications of AI                                                            | 0                    |
| 2                      | <b>SMART USE OF AI TOOLS</b><br>Communication with AI, AI tool capabilities & limitations, Tool selection for tasks, Common usage mistakes, Data privacy & confidentiality, Safety considerations, Bias and incorrect outputs                  | 0                    |
| 3                      | <b>PROMPT DESIGN FUNDAMENTALS</b><br>Introduction to prompts and Prompt structure (task, context, format), Types of prompts, Step-by-step prompting, Problem decomposition, Example-based prompting, Prompt templates (report, checklist, SOP) | 0                    |

| Contents :<br>Unit | Topics                                                                                                                                                                                                                                                                                                                         | Contact<br>Hours |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 4                  | <b>PRACTICAL ENGINEERING APPLICATIONS</b><br>Inspection applications, Maintenance applications, Safety applications, Work planning, Structured output generation, Prompt refinement, Output comparison, Workflow prompting                                                                                                     | 0                |
| 5                  | <b>AI-ASSISTED EVALUATION AND ETHICS</b><br>Using AI Tools for Code Generation, Code Debugging and Optimization, Prompt Chaining for Step-by-step Development, Detecting Hallucinations in AI-generated Code, Responsible AI Usage, Data Privacy and Security Considerations, Mini Project using Python and Prompt Engineering | 0                |
| <b>Total Hours</b> |                                                                                                                                                                                                                                                                                                                                | <b>0</b>         |

#### Suggested List of Experiments:

| Contents :<br>Unit | Topics                                                                                                            | Contact<br>Hours |
|--------------------|-------------------------------------------------------------------------------------------------------------------|------------------|
| 1                  | <b>Practical-1</b><br>Study and explore AI tools and identify their applications in engineering domains           | 2                |
| 2                  | <b>Practical-2</b><br>Compare AI tools with traditional methods for solving engineering tasks.                    | 2                |
| 3                  | <b>Practical-3</b><br>Design and use effective prompts for communication with AI tools                            | 2                |
| 4                  | <b>Practical-4</b><br>Analyze AI-generated outputs to identify errors and improve responses                       | 2                |
| 5                  | <b>Practical-5</b><br>Demonstrate responsible AI usage considering privacy, safety, and bias                      | 1                |
| 6                  | <b>Practical-6</b><br>Design structured prompts using task, context, and output format                            | 2                |
| 7                  | <b>Practical-7</b><br>Apply prompting techniques such as step-by-step, decomposition, and example-based prompting | 2                |
| 8                  | <b>Practical-8</b><br>Develop prompt templates for report, checklist, and SOP                                     | 2                |
| 9                  | <b>Practical-9</b><br>Test and refine prompts to improve output quality                                           | 2                |
| 10                 | <b>Practical-10</b><br>Generate inspection checklist, maintenance procedure, and safety instructions using AI     | 2                |
| 11                 | <b>Practical-11</b><br>Generate structured outputs (tables/reports) and compare multiple AI outputs               | 2                |

### Suggested List of Experiments:

| Contents :<br>Unit | Topics                                                                                                | Contact<br>Hours |
|--------------------|-------------------------------------------------------------------------------------------------------|------------------|
| 12                 | <b>Practical-12</b><br>Design workflow-based prompts for routine engineering tasks                    | 2                |
| 13                 | <b>Practical-13</b><br>Identify and verify incorrect AI outputs and apply prompt chaining             | 2                |
| 14                 | <b>Practical-14</b><br>Develop a mini project using prompt engineering for real-world problem solving | 3                |
| <b>Total Hours</b> |                                                                                                       | <b>28</b>        |

### Textbook :

- 1 AI for Everyone, Andrew Ng, Coursera, 2019

### References:

- 1 Prompt Engineering Guide, Prompt Engineering Guide, OpenAI, OpenAI Documentation, 2023

### Suggested Theory Distribution:

The suggested theory distribution as per Bloom's taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

| Distribution of Theory for course delivery and evaluation |            |       |         |          |                                        |
|-----------------------------------------------------------|------------|-------|---------|----------|----------------------------------------|
| Remember /<br>Knowledge                                   | Understand | Apply | Analyze | Evaluate | Higher order<br>Thinking /<br>Creative |
| 0.00                                                      | 0.00       | 35.00 | 35.00   | 30.00    | 0.00                                   |

### Instructional Method:

- 1 The course delivery method will depend upon the requirement of the content and need of students. The teacher, in addition to conventional teaching method by blackboard, may also use tools such as demonstration, coding practice, brainstorming sessions, case studies, AI-assisted learning activities and MOOCs.
- 2 The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory and classroom through assignments, prompt design activities, coding exercises and mini projects.
- 3 Practical examination will be conducted at the end of semester for evaluation of performance of students in laboratory based on programming skills and prompt engineering applications.
- 4 Students will use supplementary resources such as online videos, NPTEL lectures, e-courses, official Python documentation, AI tool user guides and virtual laboratory platforms.

**Supplementary Resources:**

- 1 NPTEL / SWAYAM Courses on Python Programming and Artificial Intelligence
- 2 OpenAI / Google AI / Microsoft Copilot Official Documentation
- 3 [https://www.tutorialspoint.com/prompt\\_engineering/index.htm](https://www.tutorialspoint.com/prompt_engineering/index.htm)