PROMPT ENGINEERING FOR CAD, CAM & CAE PROFESSIONALS

Target Audience

This course is designed for CAD Designers, Mechanical Engineers, Product Design Engineers, Manufacturing Engineers, CNC Programmers, CAE Engineers, Engineering Documentation Specialists and Engineering Team Leads who want to integrate generative AI and prompt engineering into their daily engineering workflows. Participants should have basic familiarity with CAD, CAM or CAE concepts and engineering processes. No prior experience with artificial intelligence or prompt engineering is required. Basic programming knowledge is beneficial for optional CAD scripting exercises but is not mandatory. The course is suitable for engineering professionals seeking to improve productivity, automate repetitive tasks, enhance technical documentation and apply AI-assisted workflows while maintaining engineering accuracy and validation standards.

Course Outcomes

Upon successful completion of this course, participants will be able to:

- Understand generative AI, machine learning, large language models and prompt engineering in the context of engineering applications.
- Apply structured prompting techniques to CAD, CAM and CAE workflows.
- Create effective engineering prompts for design analysis, technical documentation and manufacturing planning.
- Generate AI-assisted CAD automation scripts using AutoLISP and review their functionality.
- Optimize engineering documentation, drawing reviews, material research and repetitive engineering activities using AI.
- Analyze manufacturing process information and simulation results using structured AI prompts.
- Troubleshoot AI-generated outputs by identifying hallucinations, technical inaccuracies and logical inconsistencies.
- Design reusable prompt libraries and repeatable AI-assisted engineering workflows.
- Evaluate AI-generated engineering recommendations through manual verification, technical validation and responsible AI practices.

Course Objectives

The objectives of this course are to:

- Establish a foundational understanding of artificial intelligence, generative AI, LLMs and prompt engineering.

- Develop structured prompting skills relevant to CAD, CAM and CAE applications.
- Enable participants to use AI for engineering requirement analysis, design documentation and technical research.
- Introduce AI-assisted CAD automation and basic AutoLISP script generation.
- Develop practical capabilities in manufacturing process planning and CNC documentation.
- Introduce AI-assisted simulation planning, FEA result interpretation and technical reporting.
- Strengthen participants' ability to validate AI-generated engineering information and maintain data confidentiality.
- Build reusable prompt templates and practical AI workflows through instructor-led exercises and hands-on activities.

Course Outline

The course comprises 16 hours of theory and labs and is divided into 7 different chapters. Each chapter will be followed by hands-on lab exercises to reinforce learning and gauge understanding of the topics covered.

Table of Contents (TOC)

Module 1: Introduction to Artificial Intelligence in Engineering

2 Hours

- 1.1 Understanding AI, Machine Learning and Generative AI
- 1.2 Introduction to Large Language Models (LLMs)
- 1.3 Role of AI in CAD, CAM, CAE and BIM
- 1.4 Understanding Prompt Engineering
- 1.5 Capabilities and Limitations of AI in Engineering
- 1.6 Engineering Data Confidentiality and Responsible AI Usage

Lab 1: Compare AI-generated responses to the same engineering request using basic and structured prompts.

Module 2: Prompt Engineering Techniques for Engineers

3 Hours

- 2.1 Anatomy of an Effective Engineering Prompt
- 2.2 Role, Task, Context, Constraints and Output Format
- 2.3 Zero-Shot and Few-Shot Prompting
- 2.4 Structured Prompts for Engineering Workflows
- 2.5 Iterative Prompt Refinement
- 2.6 Requesting Structured Tables, Checklists and Technical Reports
- 2.7 Prompt Validation and Hallucination Detection

Lab 2: Develop five reusable prompts for mechanical design, drawing review, manufacturing planning, simulation reporting and engineering documentation.

Module 3: AI-Assisted CAD Design and Documentation

2.5 Hours

- 3.1 Engineering Requirement Analysis Using AI
- 3.2 Converting Design Requirements into Checklists
- 3.3 AI-Assisted Material Selection Research
- 3.4 Generating Design Alternatives and Evaluating Trade-Offs
- 3.5 Preparing Engineering Drawing Notes
- 3.6 AI-Assisted Bill of Materials Organization
- 3.7 Creating Design Review and Revision Reports

Lab 3: Convert a sample product-design specification into a design checklist, preliminary material comparison and engineering review report.

Module 4: Prompt Engineering for CAD Automation

3 Hours

- 4.1 Introduction to AI-Assisted CAD Scripting
- 4.2 Generating Simple AutoLISP Code Using Prompts
- 4.3 Understanding Script Inputs, Outputs and Error Handling
- 4.4 Reviewing and Debugging AI-Generated CAD Scripts
- 4.5 Using AI for Repetitive Drawing Tasks
- 4.6 Creating Documentation for CAD Automation Routines

Lab 4: Generate an AutoLISP routine for a simple repetitive drawing task, inspect the code and test it in AutoCAD. A guided code-review alternative will be available for participants without AutoCAD access.

Module 5: Prompt Engineering for CAM and Manufacturing

2 Hours

- 5.1 Applications of Generative AI in Manufacturing
- 5.2 Understanding Manufacturing Process Planning Prompts
- 5.3 AI-Assisted CNC Process Documentation
- 5.4 Creating Machining Operation Checklists
- 5.5 Manufacturing Troubleshooting Using Structured Prompts
- 5.6 Reviewing AI-Generated Process Recommendations

Lab 5: Create a preliminary machining process plan for a sample component, including machine selection criteria, tools, operations and a validation checklist. No AI-generated NC program will be run directly on machinery.

Module 6: Prompt Engineering for CAE and Simulation

1.5 Hours

- 6.1 AI-Assisted Simulation Planning
- 6.2 Preparing FEA Setup Checklists
- 6.3 Reviewing Boundary Conditions and Assumptions
- 6.4 Interpreting Simulation Data Using AI
- 6.5 Generating Simulation Summary Reports

Lab 6: Analyze a supplied FEA results table and prepare a draft engineering summary, including a manual validation of units, assumptions and conclusions.

Module 7: Engineering AI Workflow Development and Final Project

2 Hours

- 7.1 Developing an Engineering Prompt Library
- 7.2 Designing Repeatable AI-Assisted Workflows
- 7.3 Validating Technical Accuracy and Traceability
- 7.4 Measuring Productivity and Output Quality
- 7.5 Final Practical Project

Final Project: Build a reusable AI-assisted engineering workflow for a selected CAD, CAM or CAE task, demonstrating inputs, prompts, outputs and verification steps.