

Petrogenium. Academy

Process Technology

Artificial Intelligence (AI)

(Microsoft Copilot, Google Gemini, ChatGPT or Claude)

Consultant / Trainer

Jan van Opstal



This **Petrogenium**. 4-day course introduces engineers to the practical use of AI in Process design, Chemical Engineering, and Process Safety.

This customized four-day AI workshop equips engineering teams to apply AI directly in high-value engineering workflows, including calculations, simulations, technical documentation, process design, control strategies, HAZOP/LOPA facilitation, and safety studies. Through hands-on industrial case studies in hydrogen, ammonia, methanol, and SAF, participants learn how to improve speed, quality, and consistency while maintaining rigorous engineering validation. The workshop will be fully tailored to the client's actual needs and real-world process cases, ensuring immediate relevance and practical application from day one.

Participants



1. Process Engineers involved in process design, simulation, and optimization.
2. Chemical Engineers working on equipment sizing, thermodynamics, and reaction engineering.
3. Process Safety Engineers responsible for HAZOP, LOPA, C&E diagrams, and SIS/SRS development.
4. Control & Automation Engineers working on P&IDs, control narratives, and process automation strategies.
5. Project & Design Engineers in oil & gas, hydrogen, ammonia, methanol, and sustainable fuels projects.
6. Engineering Managers & Consultants seeking productivity gains and standardization with AI.

Artificial Intelligence (AI)



Learning Objectives

Participants will learn how to apply **AI in process design, chemical engineering, and process safety studies.**

They will develop AI skills in **calculations, equipment sizing, control schemes, and documentation support.**

The course builds AI competence in **HAZOP, LOPA, and safety instrumented system development** with AI assistance.

By the end, participants can integrate AI into **engineering workflows** while ensuring **validation against standards.**

Programme

Day 1–Integration, Validation & Case Studies with AI

Module 1: Data Handling & Integration

1. Extracting data from P&IDs, PFS, Datasheets, DCS Trend-& Alarm logs and graphs
2. Creating engineering reports and documentation
3. Using AI for knowledge management and literature search
4. Cross-checking results against standards (API, ASME, IEC, NFPA)

Module 2: Practical Case Studies with AI

1. Use of Bluebeam MAX + Claude integration for Data mining of P&IDs (PFD)
2. Ammonia storage & handling –HAZOP + C&E diagrams
3. Distillation column (propylene–propane splitter) –control & safety integration
4. Hydrogen-to-Methanol process –conceptual design study

DAY 2 – Introduction to AI in Process- & Chemical Engineering

Module 3: Introduction to AI in Process Engineering

1. Role of AI-powered tools in Chemical Engineering & Process Safety
2. Overview of AI capabilities, limitations, and reliability checks
3. Integrating AI with engineering workflows (simulation tools; HYSYS, UNISIM)
4. Importing Process Flow Schemes and P&ID in AI

Module 4: Process Design Fundamentals with AI

1. Material & Energy Balances (H&MB generation support)
2. Stream property predictions (enthalpy, phase, compositions)
3. Equipment design calculations:
 - Heat exchangers (UA, LMTD, approach temperatures)
 - Pumps & compressors (pump curves, surge line, NPSH)
 - Distillation columns (McCabe-Thiele, shortcut distillation, tray efficiency)

Workshop: Using AI to draft a Heat & Material Balance for a Distillation column case study

Day 3 – Advanced Process Design Applications with AI

Module 5: Process Control & Automation with AI

- Control loop narratives (flow, pressure, temperature, level control)
- P&ID development support and tag generation
- Control valve sizing and pump minimum flow protection
- AI as Copilot for Dynamic Simulations in UNISIM/HYSYS

Module 6: Specialised Chemical Engineering Applications with AI

1. Reactor kinetics support (CSTR, PFR, catalytic reactors)
2. Thermodynamics (VLE, EOS, property methods)
3. Separation technologies: distillation, membrane, adsorption, and extraction
4. Process intensification concepts

Workshop: AI drafting a process control scheme for a Distillation column case study

Programme

Day 4—AI in Process Safety and HAZOP & LOPA

Module 7: Process Safety Applications with AI

1. HAZOP support: deviations, causes, consequences, safeguards
2. LOPA facilitation: independent protection layers, SIL assignment
3. Cause & Effect diagrams (C&E) development
4. Safety Instrumented System (SIS) narratives & IEC-61511 SRS drafting

Module 8: Hazard Identification & Risk Assessment with AI

1. Checking spec. Breaks on P&ID and PSV scenarios
2. Overpressure Scenarios for HAZOP Studies
3. Explosion, fire, toxic release scenarios (HAZID/HAZOP integration)
4. HAZOP & LOPA pre-analysis with AI assistance

Workshop: Facilitating a mini-HAZOP with AI (Hydrogen electrolyzer case study) electrolyser

Why select Petrogenium.?

The above support will be provided by principal consultants with 30+ years world-class experience in the technology and hands-on know-how from operation of refinery units.

Contact Petrogenium.:

Email: training@petrogenium.com

Website: <https://www.petrogenium.com/training/>

Because Experience Matters