# AI Applications in Chemical Engineering Training Course

Professional Development Training Course Outline

| | | | |
|---|---|---|---|
| **Category** | General Training | **Duration** | 10 Days |
| **Base Fee** | $3,000 USD | **Delivery Mode** | Online / On-site Hybrid |

## Course Introduction

Artificial Intelligence (AI) is revolutionizing the chemical engineering industry by enabling smart manufacturing, predictive analytics, process optimization, digital transformation, machine learning-driven decision-making, autonomous operations, industrial IoT integration, advanced process control, sustainability optimization, and real-time performance monitoring. As chemical plants increasingly adopt Industry 4.0 technologies, AI-powered systems are becoming essential tools for improving operational efficiency, reducing energy consumption, enhancing product quality, minimizing downtime, and strengthening safety management across complex chemical processes.

AI Applications in Chemical Engineering Training Course provides participants with practical knowledge and hands-on experience in applying Artificial Intelligence, Machine Learning (ML), Deep Learning, Digital Twins, Generative AI, and Industrial Data Science within chemical engineering environments. Participants will explore real-world industrial applications, emerging technologies, implementation strategies, and successful case studies that demonstrate how AI is transforming chemical production, refining, petrochemicals, pharmaceuticals, energy systems, and sustainable manufacturing operations.

## Programme Curriculum

**AI Applications in Chemical Engineering Training Course**

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**Course Duration**

10 Days

**Course Objectives**

By the end of this training course, participants will be able to:

1. Understand AI fundamentals and their applications in chemical engineering.
2. Apply machine learning algorithms for process optimization.
3. Develop predictive maintenance models using industrial data.
4. Implement AI-driven advanced process control strategies.
5. Analyze large-scale chemical process datasets using data analytics tools.
6. Design digital twin models for plant performance improvement.
7. Utilize deep learning techniques for process monitoring and fault detection.
8. Integrate Industrial IoT and AI technologies for smart manufacturing.
9. Optimize energy efficiency using AI-powered analytical tools.
10. Apply AI solutions for sustainability and carbon reduction initiatives.
11. Evaluate generative AI applications in process engineering workflows.
12. Improve safety management through intelligent risk prediction systems.
13. Develop AI implementation roadmaps for industrial chemical facilities.

**Target Audience**

This course is designed for:

1. Chemical Engineers
2. Process Engineers
3. Production Engineers
4. Plant Managers
5. Operations Supervisors
6. Data Scientists working in industrial sectors
7. Automation and Control Engineers
8. R&D and Innovation Professionals

**Course Modules**

**Module 1: Introduction to AI in Chemical Engineering**

- Evolution of AI in industrial applications
- AI technologies and terminology
- Industry 4.0 and smart manufacturing

- Opportunities and challenges
- AI adoption roadmap
- **Case Study:** AI transformation in a modern petrochemical complex.

**Module 2: Fundamentals of Data Science for Chemical Engineers**

- Industrial data collection methods
- Data preprocessing and cleaning
- Data visualization techniques
- Statistical analysis fundamentals
- Data quality management
- **Case Study:** Data-driven improvement of reactor performance.

**Module 3: Machine Learning Fundamentals**

- Supervised learning techniques
- Unsupervised learning methods
- Classification and regression models
- Model training and validation
- Industrial AI applications
- **Case Study:** Product quality prediction using machine learning.

**Module 4: Predictive Maintenance Applications**

- Equipment health monitoring
- Failure prediction methodologies
- Sensor data analytics
- Maintenance optimization strategies
- Reliability-centered maintenance
- **Case Study:** Predictive maintenance for centrifugal compressors.

**Module 5: AI-Driven Process Optimization**

- Process performance indicators
- Optimization algorithms
- Real-time process improvement
- Production efficiency enhancement
- Cost reduction techniques
- **Case Study:** AI optimization of distillation column operations.

**Module 6: Advanced Process Control Using AI**

- Model predictive control (MPC)
- Intelligent control systems
- Adaptive control techniques
- AI-enhanced process stability
- Performance benchmarking
- **Case Study:** AI-assisted refinery process control system.

**Module 7: Deep Learning Applications**

- Neural network fundamentals

- Deep learning architectures
- Pattern recognition techniques
- Process anomaly detection
- Industrial image analytics
- **Case Study:** Deep learning for catalyst performance monitoring.

**Module 8: Digital Twins for Chemical Plants**

- Digital twin concepts
- Virtual plant modeling
- Real-time simulation integration
- Predictive operational analysis
- Asset performance management
- **Case Study:** Digital twin implementation in a fertilizer plant.

**Module 9: Industrial IoT and AI Integration**

- Smart sensors and connectivity
- Edge computing applications
- Real-time data acquisition
- Industrial communication protocols
- Cyber-physical systems
- **Case Study:** IoT-enabled chemical production facility.

**Module 10: AI for Safety and Risk Management**

- Process hazard prediction
- Intelligent safety monitoring
- Risk assessment automation
- Emergency response optimization
- Safety performance analytics
- **Case Study:** AI-based accident prevention system.

**Module 11: Sustainability and Energy Optimization**

- Carbon footprint analytics
- Energy consumption forecasting
- Resource efficiency improvement
- Circular economy applications
- Sustainable manufacturing strategies
- **Case Study:** AI-driven energy savings in a chemical plant.

**Module 12: Generative AI in Chemical Engineering**

- Generative AI fundamentals
- Engineering knowledge management
- AI-assisted technical documentation
- Process troubleshooting support
- Engineering productivity enhancement
- **Case Study:** Generative AI for operational decision support.

**Module 13: AI Applications in Research and Development**

- AI-assisted material discovery
- Catalyst development optimization
- Experimental design acceleration
- Chemical formulation analytics
- Innovation management
- **Case Study:** Machine learning in advanced catalyst development.

**Module 14: AI Implementation Strategy and Governance**

- AI project planning
- Change management practices
- AI governance frameworks
- Ethical and regulatory considerations
- ROI measurement techniques
- **Case Study:** Enterprise-wide AI deployment strategy.

**Module 15: Future Trends and Capstone Project**

- Autonomous chemical plants
- Explainable AI technologies
- AI and robotics integration
- Emerging industrial innovations
- Capstone implementation project
- **Case Study:** Designing an AI-enabled smart chemical manufacturing facility.

**Register as a group from 3 participants for a Discount**

**Send us an email: info@fineskilltrainingcenter.org or call** *+254769199797*

***Certification***

*Upon successful completion of this training, participants will be issued with a globally- recognized certificate.*

***Tailor-Made Course***

*We also offer tailor-made courses based on your needs.*

**Key Notes**

**a.** The participant must be conversant with English.

**b.** Upon completion of training the participant will be issued with an Authorized Training Certificate

**c.** Course duration is flexible and the contents can be modified to fit any number of days.

**d.** The course fee includes facilitation training materials, 2 coffee breaks, buffet lunch and A Certificate upon successful completion of Training.

**e.** One-year post-training support Consultation and Coaching provided after the course.

**f.** Payment should be done at least a week before commence of the training, to Fineskill Training Center account, as indicated in the invoice so as to enable us prepare better for you.

## Upcoming Scheduled Sessions

| Start Date | End Date | Location | Price |
|---|---|---|---|
| **23 Nov 2026** | 04 Dec 2026 | Online | $2,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $3,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $6,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $6,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $9,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |
| **23 Nov 2026** | 04 Dec 2026 | Physical | $12,000 |

Ready to enroll or request a customized program? Book online or contact us:

**Register Online Now**

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