Data Analytics for Chemical Engineering Research Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	5 Days
Base Fee	$1,500 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Data Analytics for Chemical Engineering Research Training Course designed to bridge the gap between traditional chemical engineering principles and modern data-driven decision-making, machine learning, and industrial AI analytics. As the chemical industry rapidly transitions into Industry 4.0, smart manufacturing, and predictive process optimization, engineers must evolve beyond classical modeling to integrate big data analytics, process simulation, and artificial intelligence (AI) into research and operational workflows. This training equips participants with advanced skills in Python-based analytics, process data interpretation, statistical modeling, and real-time optimization techniques for chemical processes.

The program emphasizes hands-on mastery of predictive modeling, process control analytics, multivariate data analysis (MVDA), and digital twin technologies applied in chemical engineering research. Learners will explore how to transform raw experimental and plant data into actionable insights that improve yield optimization, energy efficiency, sustainability, and process safety. By integrating machine learning algorithms, chemometrics, and industrial data visualization tools, this course empowers researchers and engineers to solve complex chemical engineering problems using modern analytical frameworks aligned with global trends in smart chemical plants, green engineering, and digital transformation.

Programme Curriculum

Data Analytics for Chemical Engineering Research Training Course

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Course Duration

5 days

Course Objectives

1. Master Industrial Data Analytics for Chemical Processes Optimization
2. Apply Machine Learning in Chemical Engineering Research Modeling
3. Develop skills in Python for Scientific and Process Data Analysis
4. Implement Big Data Analytics in Chemical Plant Operations
5. Use Statistical Process Control (SPC) and Multivariate Analysis (MVDA)
6. Design Predictive Maintenance Models for Chemical Equipment
7. Integrate Artificial Intelligence in Reaction Engineering Studies
8. Apply Digital Twin Technology in Chemical Process Simulation
9. Perform Process Optimization using Data-Driven Techniques
10. Enhance Sustainability Analytics in Green Chemical Engineering
11. Utilize Advanced Data Visualization for Process Decision Making
12. Conduct Chemometrics and Experimental Data Interpretation
13. Build End-to-End Industrial Analytics Solutions for R&D

Target Audience

1. Chemical Engineering Students
2. Process Engineers in Petrochemical & Refinery Industries
3. Research Scientists in Chemical & Materials Engineering
4. Industrial Data Analysts in Manufacturing Sectors
5. Quality Control & Process Control Engineers
6. R&D Professionals in Pharmaceuticals & Polymers
7. Academic Lecturers and Research Supervisors
8. Energy, Environment, and Sustainability Analysts

Course Modules

Module 1: Foundations of Data Analytics in Chemical Engineering

- Introduction to industrial data ecosystems
- Types of chemical engineering datasets
- Data lifecycle in chemical processes
- Python, Excel, MATLAB basics

- Case Study: Analyzing distillation column operational data for efficiency improvement

Module 2: Python Programming for Chemical Data Science

- Python fundamentals for engineers
- NumPy, Pandas for process data handling
- Data cleaning and preprocessing techniques
- Time-series data handling in process industries
- Case Study: Cleaning refinery temperature sensor datasets

Module 3: Statistical Analysis & Process Modeling

- Descriptive and inferential statistics
- Regression modeling for chemical processes
- ANOVA in experimental design
- Correlation analysis in reaction systems
- Case Study: Reaction yield prediction using regression models

Module 4: Machine Learning in Chemical Engineering

- Supervised and unsupervised learning
- Classification of process states
- Clustering of chemical process behaviors
- Model evaluation metrics
- Case Study: Predicting catalyst performance using ML models

Module 5: Multivariate Data Analysis (MVDA) & Chemometrics

- Principal Component Analysis (PCA)
- Partial Least Squares (PLS) regression
- Pattern recognition in process data
- Spectral data interpretation
- Case Study: Pharmaceutical formulation optimization using PCA

Module 6: Process Optimization & Control Analytics

- Optimization algorithms in chemical processes
- Statistical Process Control (SPC) charts
- Real-time process monitoring
- Constraint-based optimization models
- Case Study: Heat exchanger network optimization

Module 7: Digital Twins & Simulation Analytics

- Concept of digital twins in chemical plants
- Simulation vs real-time process matching
- Predictive modeling for plant performance
- Integration with IoT sensors
- Case Study: Digital twin of a continuous stirred tank reactor (CSTR)

Module 8: AI-Driven Sustainability & Industrial Applications

- Carbon footprint analytics

- Energy efficiency modeling
- Waste minimization using data analytics
- Smart chemical plant frameworks
- Case Study: AI-based emissions reduction in a petrochemical plant

Training Methodology

This course employs a participatory and hands-on approach to ensure practical learning, including:

- Interactive lectures and presentations.
- Group discussions and brainstorming sessions.
- Hands-on exercises using real-world datasets.
- Role-playing and scenario-based simulations.
- Analysis of case studies to bridge theory and practice.
- Peer-to-peer learning and networking.
- Expert-led Q&A sessions.
- Continuous feedback and personalized guidance.

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	27 Nov 2026	Online	$1,000
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$3,000
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$4,500
23 Nov 2026	27 Nov 2026	Physical	$6,000
23 Nov 2026	27 Nov 2026	Physical	$6,000

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

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