Chemical Process Development and Scale-Up 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

Chemical Process Development and Scale-Up is a critical discipline in modern pharmaceutical manufacturing, fine chemicals, biotechnology, and industrial chemical engineering, ensuring seamless transition from laboratory innovation to full-scale commercial production. This training course provides a deep dive into Process Design, Optimization, Scale-Up Strategies, Quality by Design (QbD), Process Analytical Technology (PAT), GMP compliance, and tech transfer protocols. Participants will gain practical expertise in transforming bench-scale reactions into robust, cost-effective, and regulatory-compliant industrial processes while minimizing risk, improving yield, and ensuring product quality consistency.

In today's competitive and highly regulated environment, organizations demand professionals skilled in advanced chemical engineering principles, process intensification, digital manufacturing, continuous processing, and lifecycle process validation. Chemical Process Development and Scale-Up Training Course bridges the gap between R&D and manufacturing by equipping learners with industry-relevant competencies in scale-up modeling, reactor design, process safety, kinetic studies, and regulatory documentation. Through real-world case studies and hands-on simulations, participants will master the art and science of delivering scalable, sustainable, and economically viable chemical processes.

Programme Curriculum

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Course Duration

5 days

Course Objectives

1. Master Chemical Process Development Lifecycle (CPLD) from lab to plant scale
2. Apply Quality by Design (QbD) principles in process optimization
3. Understand Process Scale-Up & Scale-Down methodologies
4. Design and evaluate chemical reactors for industrial production
5. Implement Process Analytical Technology (PAT) for real-time monitoring
6. Conduct reaction kinetics and thermodynamics analysis
7. Ensure GMP & regulatory compliance
8. Develop robust tech transfer protocols and documentation
9. Apply process intensification and continuous manufacturing concepts
10. Perform risk assessment using HAZOP and FMEA tools
11. Optimize yield, selectivity, and process efficiency
12. Integrate digital process simulation and modeling tools
13. Execute industrial case-based scale-up troubleshooting strategies

Target Audience

1. Chemical Engineers in manufacturing and R&D
2. Pharmaceutical Scientists and Process Chemists
3. Biotechnology and Bioprocess Engineers
4. Quality Assurance and Validation Specialists
5. Production and Plant Managers
6. Regulatory Affairs Professionals
7. Industrial Research Scientists
8. Graduate students in Chemical / Biochemical Engineering

Course Modules

Module 1: Fundamentals of Chemical Process Development

- Process lifecycle from discovery to commercialization
- Unit operations and process flow design
- Reaction engineering basics
- Laboratory vs industrial scale differences

- Material and energy balance fundamentals
- **Case Study:** Scale-up of aspirin synthesis from lab to pilot plant

Module 2: Reaction Kinetics & Thermodynamic Modeling

- Rate laws and reaction mechanisms
- Temperature and pressure effects on yield
- Equilibrium limitations in industrial processes
- Catalyst selection and optimization
- Data-driven kinetic modelling
- **Case Study:** Optimization of ammonia synthesis process

Module 3: Scale-Up and Scale-Down Strategies

- Geometric, dynamic, and kinematic similarity
- Scale-up parameters and constraints
- Mixing, heat transfer, and mass transfer effects
- Pilot plant design considerations
- Scale-down models for troubleshooting
- **Case Study:** API crystallization scale-up failure analysis

Module 4: Process Analytical Technology (PAT) & Control

- Real-time monitoring techniques
- Spectroscopic and sensor-based PAT tools
- Feedback and feedforward control systems
- Data acquisition and process automation
- Digital twin concepts
- **Case Study:** Real-time monitoring in continuous fermentation

Module 5: Quality by Design (QbD) & Regulatory Compliance

- Critical Quality Attributes (CQA)
- Design of Experiments (DoE)
- Risk-based process design
- ICH Q8, Q9, Q10 guidelines
- Validation lifecycle approach
- **Case Study:** QbD implementation in tablet manufacturing process

Module 6: Process Safety & Risk Management

- HAZOP and FMEA methodologies
- Thermal runaway and explosion risks
- Chemical compatibility analysis
- Safety instrumentation systems
- Industrial incident case reviews
- **Case Study:** Industrial reactor explosion root cause analysis

Module 7: Tech Transfer & Industrial Scale Manufacturing

- Documentation for technology transfer
- Pilot plant to commercial plant transition

- Cross-functional team coordination
- Manufacturing process validation
- Cost optimization strategies
- **Case Study:** Tech transfer of antibiotic production process

Module 8: Process Intensification & Continuous Manufacturing

- Batch vs continuous processing
- Microreactors and flow chemistry
- Energy-efficient process design
- Green chemistry integration
- Sustainability and waste minimization
- **Case Study:** Continuous flow synthesis of fine chemicals

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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