Continuous Reactor Systems 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

Continuous Reactor Systems are at the core of modern **chemical engineering, process** intensification, and industrial-scale production, enabling efficient, scalable, and highly controlled reactions in industries such as petrochemicals, pharmaceuticals, food processing, polymers, and renewable fuels. Continuous Reactor Systems Training Course provides a comprehensive understanding of Continuous Stirred Tank Reactors, Plug Flow Reactors, tubular reactors, and advanced hybrid systems, focusing on real-world operational excellence, safety optimization, and performance efficiency in high-demand industrial environments.

With increasing global demand for process automation, green chemistry, AI-driven process control, and sustainable manufacturing, continuous reactor technology has become a critical pillar of Industry 4.0. This course equips learners with practical and theoretical expertise in reaction kinetics, heat and mass transfer, reactor design, scale-up strategies, process monitoring, and optimization techniques, ensuring they are industry-ready for high-performance chemical process operations and advanced manufacturing systems.

Programme Curriculum

Continuous Reactor Systems Training Course

Introduction

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Course Duration

5 days

Course Objectives

1. Master fundamentals of continuous reactor design and operation
2. Understand reaction kinetics and catalytic processes
3. Analyze CSTR, PFR, and tubular reactor performance
4. Apply mass transfer and heat transfer principles
5. Optimize residence time distribution (RTD)
6. Improve process intensification and yield efficiency
7. Implement real-time process monitoring and control systems
8. Integrate automation and AI-based process optimization
9. Ensure process safety and hazard mitigation
10. Perform reactor scale-up and industrial design calculations
11. Evaluate sustainable and green chemical processes
12. Diagnose and troubleshoot reactor inefficiencies and failures
13. Apply Industry 4.0 smart manufacturing principles

Target Audience

1. Chemical engineers in **process industries**
2. Petroleum and petrochemical plant operators
3. Pharmaceutical manufacturing professionals
4. Process design and R&D engineers
5. Industrial safety and operations managers
6. Graduate students in **chemical engineering**
7. Quality control and production supervisors
8. Sustainability and green technology specialists

Course Module

Module 1: Fundamentals of Continuous Reactor Systems

- Overview of continuous vs batch reactors
- Industrial applications in **chemical and petrochemical sectors**
- Flow dynamics in continuous systems
- Introduction to reactor configurations
- Case Study: Continuous ammonia production optimization in fertilizer plants

Module 2: Reaction Kinetics and Mechanisms

- Rate laws and reaction order determination
- Catalytic and non-catalytic reactions
- Temperature and pressure effects on kinetics

- Activation energy and Arrhenius equation applications
- Case Study: Optimization of catalytic cracking in refinery units

Module 3: CSTR Design and Operation

- Steady-state and transient behavior
- Mixing efficiency and conversion rates
- Volume and residence time calculations
- Multi-CSTR systems in series and parallel
- Case Study: Wastewater treatment using CSTR technology

Module 4: Plug Flow Reactor (PFR) Systems

- Ideal and non-ideal flow behavior
- Conversion profiles along reactor length
- Heat integration in tubular reactors
- Pressure drop and velocity distribution
- Case Study: Polymer production in continuous tubular reactors

Module 5: Heat and Mass Transfer in Reactors

- Convective and conductive heat transfer
- Diffusion and mass transfer limitations
- Heat exchanger integration with reactors
- Temperature control strategies in exothermic reactions
- Case Study: Exothermic reaction control in methanol synthesis

Module 6: Residence Time Distribution (RTD) Analysis

- RTD concepts and measurement techniques
- Tracer studies and interpretation
- Deviation from ideal reactor behavior
- Mixing and dispersion modeling
- Case Study: RTD analysis in pharmaceutical reactor systems

Module 7: Process Control and Automation

- SCADA and DCS systems in reactor control
- Sensors and instrumentation for continuous monitoring
- Feedback and feedforward control strategies
- AI and machine learning in process optimization
- Case Study: Smart refinery reactor automation using predictive control

Module 8: Scale-Up, Safety and Sustainability

- Laboratory to industrial scale-up methodologies
- Hazard identification and risk assessment (HAZOP)
- Green chemistry and sustainable reactor design
- Energy efficiency and carbon footprint reduction
- Case Study: Sustainable biofuel production in continuous reactors

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

Start Date	End Date	Location	Price
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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