Biochemical Reactor Engineering 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

Biochemical Reactor Engineering is a critical interdisciplinary field that integrates biotechnology, biochemical engineering, process engineering, industrial microbiology, bioprocess optimization, fermentation technology, and biomanufacturing systems to design, operate, and optimize biological production processes. As industries increasingly adopt sustainable bioprocessing, bioeconomy solutions, precision fermentation, synthetic biology, and advanced biopharmaceutical manufacturing, professionals require specialized knowledge to enhance reactor performance, improve product yields, and ensure regulatory compliance. Biochemical Reactor Engineering Training Course provides comprehensive insights into the principles, design methodologies, operational strategies, and industrial applications of biochemical reactors used in modern biotechnology industries.

The course emphasizes industrial bioreactor design, process intensification, scale-up strategies, digital bioprocessing, Industry 4.0 integration, process analytical technology (PAT), artificial intelligence in biomanufacturing, and sustainable biotechnology solutions. Participants will gain practical expertise in reactor selection, mass transfer optimization, kinetic modeling, computational simulation, downstream integration, and process control systems through real-world case studies and hands-on exercises. The training equips professionals with the skills required to improve productivity, reduce operational costs, enhance product quality, and drive innovation in the rapidly evolving biotechnology and biopharmaceutical sectors.

Programme Curriculum

Biochemical Reactor Engineering Training Course

Introduction

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and biomanufacturing systems to design, operate, and optimize biological production processes. As industries increasingly adopt sustainable bioprocessing, bioeconomy solutions, precision fermentation, synthetic biology, and advanced biopharmaceutical manufacturing, professionals require specialized knowledge to enhance reactor performance, improve product yields, and ensure regulatory compliance. Biochemical Reactor Engineering Training Course provides comprehensive insights into the principles, design methodologies, operational strategies, and industrial applications of biochemical reactors used in modern biotechnology industries.

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Course Duration

5 days

Course Objectives

Upon completion of this training, participants will be able to:

1. Understand advanced Biochemical Reactor Engineering principles and industrial applications.
2. Analyze bioreactor design and optimization strategies for enhanced productivity.
3. Apply bioprocess modeling and simulation techniques for reactor performance evaluation.
4. Optimize fermentation technology and microbial cultivation systems.
5. Implement Process Analytical Technology (PAT) for real-time process monitoring.
6. Improve mass transfer and oxygen transfer efficiency in bioreactors.
7. Utilize Artificial Intelligence (AI) and Machine Learning in bioprocess optimization.
8. Develop effective scale-up and scale-down methodologies for industrial production.
9. Design sustainable and energy-efficient biomanufacturing processes.
10. Integrate Industry 4.0 and Digital Twin technologies into bioprocess operations.
11. Enhance quality assurance and regulatory compliance in biotechnology manufacturing.
12. Evaluate advanced cell culture bioreactors and biopharmaceutical production systems.
13. Apply process control and automation technologies to improve operational excellence.

Target Audience

1. Biochemical Engineers
2. Biotechnology Professionals
3. Bioprocess Engineers
4. Process Engineers
5. Fermentation Specialists
6. Pharmaceutical Manufacturing Professionals
7. Research Scientists and Academics
8. Production Managers and Plant Supervisors

Course Modules

Module 1: Fundamentals of Biochemical Reactor Engineering

- Principles of biochemical reaction engineering
- Bioreactor classifications and applications
- Biochemical kinetics and reaction mechanisms
- Microbial growth dynamics
- Reactor performance parameters
- **Case Study:** Optimization of industrial ethanol fermentation reactors.

Module 2: Bioreactor Design and Selection

- Stirred tank bioreactors
- Airlift and bubble column reactors
- Packed-bed and fluidized-bed reactors
- Photobioreactor systems
- Design criteria and equipment selection
- **Case Study:** Bioreactor selection for large-scale monoclonal antibody production.

Module 3: Fermentation Technology and Process Optimization

- Batch, fed-batch, and continuous fermentation
- Media formulation strategies
- Nutrient feeding optimization
- Productivity enhancement techniques
- Contamination prevention methods
- **Case Study:** High-cell-density fermentation in biopharmaceutical manufacturing.

Module 4: Mass Transfer and Mixing Operations

- Gas-liquid mass transfer fundamentals
- Oxygen transfer rate optimization
- Mixing and agitation technologies
- Hydrodynamic behavior in reactors
- Scale-up considerations
- **Case Study:** Improving oxygen transfer efficiency in recombinant protein production.

Module 5: Bioprocess Modeling, Simulation and Digitalization

- Mathematical modeling of bioreactors
- Computational Fluid Dynamics (CFD)
- Process simulation software applications
- Digital Twin technology
- Predictive analytics and optimization
- **Case Study:** Digital twin implementation for industrial bioprocess monitoring.

Module 6: Process Control, Automation and Industry 4.0

- Advanced process control systems
- Sensor technologies and PAT
- SCADA and automation platforms
- AI-driven process optimization
- Smart manufacturing integration

- **Case Study:** AI-enabled fermentation process control in biotech industries.

Module 7: Scale-Up, Validation and Regulatory Compliance

- Scale-up methodologies
- Technology transfer principles
- Process validation requirements
- GMP and regulatory standards
- Risk assessment and quality management
- **Case Study:** Commercial scale-up of vaccine production facilities.

Module 8: Emerging Trends and Sustainable Biomanufacturing

- Synthetic biology applications
- Precision fermentation technologies
- Carbon-neutral bioprocessing
- Circular bioeconomy concepts
- Future bioreactor innovations
- **Case Study:** Sustainable biomanufacturing for bio-based chemical production.

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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