Biotechnology Scale-Up Techniques 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

Biotechnology scale-up is a critical bridge between laboratory innovation and commercial biomanufacturing, enabling the transformation of bioprocesses from bench-scale experiments into industrial-scale production systems. Biotechnology Scale-Up Techniques Training Course provides a comprehensive, hands-on understanding of bioprocess scale-up, bioreactor optimization, fermentation technology, downstream processing, and GMP-compliant biomanufacturing workflows. Participants will gain practical exposure to cell culture expansion, microbial fermentation scale-up, process validation, and quality assurance systems that drive modern biopharmaceutical production, industrial enzymes, vaccines, and recombinant proteins.

With increasing global demand for biologics, biosimilars, precision medicine, and sustainable bio-based products, mastering scale-up techniques has become essential for biotechnology professionals. This course equips learners with advanced skills in process engineering, bioreactor design, oxygen transfer optimization, process control strategies, and regulatory compliance. Through real-world case studies and industry-relevant simulations, participants will understand how to reduce production costs, improve yield efficiency, and ensure consistent product quality in large-scale biotechnology manufacturing environments.

Programme Curriculum

Biotechnology Scale-Up Techniques Training Course

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Course Duration

5 days

Course Objectives

1. Understand bioprocess scale-up principles from lab to industrial production
2. Apply bioreactor design and optimization techniques for maximum yield
3. Analyze oxygen transfer rate (OTR) and kLa optimization strategies
4. Develop skills in fermentation technology and microbial cultivation scaling
5. Evaluate cell culture scale-up for mammalian and microbial systems
6. Implement process control and automation in biomanufacturing systems
7. Master downstream processing and purification scale-up methods
8. Apply GMP, FDA, and EMA regulatory compliance frameworks
9. Optimize bioprocess parameters using statistical and DoE approaches
10. Understand single-use bioreactor systems and continuous processing trends
11. Improve yield efficiency and productivity in large-scale fermentation
12. Apply tech transfer strategies from R&D to production plants
13. Integrate sustainable biomanufacturing and green biotechnology practices

Target Audience

1. Biotechnology engineers and bioprocess engineers
2. Biochemists and microbiologists
3. Pharmaceutical manufacturing professionals
4. Biomedical and biochemical engineering students
5. QA/QC professionals in biopharma industries
6. R&D scientists in biotech companies
7. Fermentation and industrial microbiology specialists
8. Regulatory affairs and validation specialists

Course Modules

Module 1: Fundamentals of Bioprocess Scale-Up

- Principles of laboratory-to-industrial transition
- Bioprocess flow and unit operations overview
- Scaling laws and similarity criteria
- Material and energy balance in bioprocessing
- Case Study: Scale-up of insulin production using recombinant E. coli fermentation

Module 2: Bioreactor Design and Engineering

- Types of bioreactors
- Mixing, aeration, and agitation systems
- Sensor integration and control systems
- Sterilization and contamination control
- Case Study: Industrial-scale monoclonal antibody production in stirred-tank bioreactors

Module 3: Fermentation Technology and Microbial Scale-Up

- Batch, fed-batch, and continuous fermentation
- Media optimization and nutrient feeding strategies
- Oxygen transfer and metabolic regulation
- Scale-up challenges in microbial systems
- Case Study: Penicillin industrial fermentation scale-up optimization

Module 4: Mammalian Cell Culture Scale-Up

- CHO cell line expansion techniques
- Serum-free and suspension culture systems
- Shear stress management in large bioreactors
- Cell viability and productivity optimization
- Case Study: Scale-up of erythropoietin (EPO) production in CHO cells

Module 5: Downstream Processing and Purification

- Cell harvesting and clarification methods
- Chromatography scale-up strategies
- Filtration and centrifugation technologies
- Product recovery and purification efficiency
- Case Study: Industrial purification of recombinant monoclonal antibodies

Module 6: Process Control and Automation

- SCADA systems in biomanufacturing
- Real-time monitoring and PAT tools
- Data analytics and process optimization
- Feedback and feedforward control systems
- Case Study: Automated vaccine production monitoring system

Module 7: Regulatory Compliance and GMP Scale-Up

- GMP guidelines in bioprocessing
- Technology transfer documentation
- Validation and qualification protocols
- Risk assessment and quality systems
- Case Study: FDA-approved biosimilar manufacturing scale-up

Module 8: Advanced Trends in Biomanufacturing

- Single-use bioreactor systems
- Continuous bioprocessing technologies
- AI and machine learning in bioprocess optimization
- Sustainable and green biotechnology approaches

- Case Study: Continuous production of viral vectors for gene therapy

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

Start Date	End Date	Location	Price
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:

Register Online Now

Email: info@fineskilltrainingcenter.com | Website: www.fineskilltrainingcenter.com