Fermentation Technology for Industry Training Course

Professional Development Training Course Outline

Category	General Training	**Duration**	10 Days
Base Fee	$3,000 USD	**Delivery Mode**	Online / On-site Hybrid

Course Introduction

Fermentation Technology is a cornerstone of modern biotechnology, bioprocess engineering, industrial microbiology, bio-manufacturing, sustainable production, precision fermentation, synthetic biology, biopharmaceutical manufacturing, food biotechnology, and circular bioeconomy systems. Industries worldwide are increasingly adopting advanced fermentation processes to manufacture pharmaceuticals, vaccines, enzymes, biofuels, organic acids, probiotics, specialty chemicals, and high-value bioproducts. The integration of Industry 4.0, automation, artificial intelligence (AI), digital bioprocessing, process analytical technology (PAT), and data-driven manufacturing has transformed fermentation into a highly efficient and scalable industrial operation.

Fermentation Technology for Industry Training Course provides participants with practical and theoretical knowledge of fermentation principles, microbial cultivation, bioreactor design, process optimization, scale-up strategies, quality control, regulatory compliance, and emerging industrial applications. Participants will gain hands-on insights into modern fermentation technologies used across pharmaceutical, food, agricultural, environmental, and bioenergy industries, enabling them to improve productivity, product quality, process sustainability, and operational excellence.

Programme Curriculum

Fermentation Technology for Industry Training Course

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Course Objectives

By the end of this course, participants will be able to:

1. Understand advanced principles of industrial fermentation technology.
2. Analyze microbial growth kinetics and metabolic engineering strategies.
3. Design and optimize industrial bioreactor systems.
4. Implement precision fermentation and synthetic biology applications.
5. Apply upstream processing techniques for maximum productivity.
6. Optimize downstream processing and product recovery operations.
7. Evaluate fermentation process economics and commercial viability.
8. Utilize AI-driven process monitoring and automation tools.
9. Implement Process Analytical Technology (PAT) in fermentation systems.
10. Apply GMP, regulatory compliance, and quality assurance requirements.
11. Develop scale-up and technology transfer strategies.
12. Improve sustainability through circular bioeconomy approaches.
13. Assess emerging innovations in industrial biotechnology and bio-manufacturing.

Target Audience

This course is designed for:

1. Bioprocess Engineers
2. Biotechnology Professionals
3. Industrial Microbiologists
4. Pharmaceutical Manufacturing Specialists
5. Fermentation Plant Operators
6. Food and Beverage Technologists
7. Research Scientists and R&D Personnel
8. Production Managers and Technical Supervisors

Course Modules

Module 1: Fundamentals of Fermentation Technology

- History and evolution of fermentation

- Types of fermentation processes
- Industrial applications
- Fermentation product categories
- Process workflow overview
- **Case Study:** Commercial production of citric acid using microbial fermentation.

Module 2: Industrial Microbiology

- Microbial classification
- Industrial microorganisms
- Strain selection criteria
- Microbial physiology
- Culture preservation techniques
- **Case Study:** Selection of yeast strains for ethanol production.

Module 3: Microbial Growth and Kinetics

- Growth phases and dynamics
- Kinetic modeling
- Monod equation applications
- Biomass yield calculations
- Productivity measurements
- **Case Study:** Optimization of bacterial growth in enzyme manufacturing.

Module 4: Fermentation Media Development

- Nutritional requirements
- Carbon and nitrogen sources
- Media formulation strategies
- Cost-effective media design
- Media sterilization
- **Case Study:** Low-cost substrate utilization in industrial fermentation.

Module 5: Bioreactor Design and Operation

- Bioreactor types
- Mixing and aeration systems
- Oxygen transfer mechanisms
- Instrumentation and controls
- Reactor performance evaluation
- **Case Study:** Design optimization of a large-scale stirred tank bioreactor.

Module 6: Upstream Processing

- Inoculum preparation
- Seed train development
- Sterilization methods
- Contamination prevention
- Process setup procedures
- **Case Study:** Scale-up of microbial inoculum production.

Module 7: Process Monitoring and Control

- Sensor technologies
- Online monitoring systems
- PAT implementation
- Automated control systems
- Digital fermentation platforms
- **Case Study:** Real-time fermentation monitoring using smart sensors.

Module 8: Advanced Fermentation Processes

- Batch fermentation
- Fed-batch fermentation
- Continuous fermentation
- Perfusion technologies
- Hybrid processing approaches
- **Case Study:** Fed-batch optimization for recombinant protein production.

Module 9: Metabolic Engineering and Synthetic Biology

- Genetic engineering principles
- Pathway optimization
- Strain improvement technologies
- CRISPR applications
- Precision fermentation
- **Case Study:** Engineered microbes for specialty chemical production.

Module 10: Downstream Processing

- Cell harvesting methods
- Product extraction techniques
- Filtration technologies
- Purification strategies
- Product formulation
- **Case Study:** Recovery and purification of industrial enzymes.

Module 11: Scale-Up and Technology Transfer

- Laboratory-to-pilot scale transition
- Pilot plant operations
- Industrial scale-up challenges
- Technology transfer methodology
- Risk management
- **Case Study:** Scale-up of antibiotic fermentation production.

Module 12: Quality Assurance and Regulatory Compliance

- GMP requirements
- Validation procedures
- Documentation systems
- Regulatory frameworks
- Quality risk management
- **Case Study:** GMP implementation in fermentation facilities.

Module 13: Industrial Applications of Fermentation

- Pharmaceutical products
- Food and beverage production
- Agricultural biotechnology
- Biofuel manufacturing
- Industrial enzyme production
- **Case Study:** Fermentation technology in vaccine manufacturing.

Module 14: Sustainability and Green Fermentation

- Circular bioeconomy principles
- Waste valorization
- Resource efficiency
- Carbon footprint reduction
- Environmental compliance
- **Case Study:** Conversion of agricultural waste into bio-based products.

Module 15: Emerging Trends and Future Technologies

- AI-driven fermentation systems
- Digital twins in bioprocessing
- Smart biomanufacturing
- Advanced bioreactor technologies
- Future industrial opportunities
- **Case Study:** AI-enabled predictive fermentation optimization.

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	04 Dec 2026	Online	$2,000
23 Nov 2026	04 Dec 2026	Physical	$3,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$6,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$9,000
23 Nov 2026	04 Dec 2026	Physical	$12,000
23 Nov 2026	04 Dec 2026	Physical	$12,000

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

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