Advanced Separation Technologies 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

Advanced Separation Technologies Training Course is designed to equip professionals with cutting-edge knowledge in membrane separation, adsorption technologies, distillation systems, extraction processes, and hybrid separation techniques. With increasing global demand for energy-efficient, low-carbon, and high-purity separation solutions, industries are rapidly shifting toward advanced separation systems that reduce cost, improve yield, and enhance environmental compliance.

This course provides a comprehensive understanding of both theoretical principles and industrial applications of advanced separation processes in petrochemical, pharmaceutical, water treatment, food processing, and gas purification industries. Participants will gain hands-on insights into real-world engineering challenges, optimization strategies, and emerging innovations such as nanomaterial membranes, AI-driven process control, and sustainable separation design frameworks.

Programme Curriculum

Advanced Separation Technologies Training Course

Introduction

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Course Objectives

1. Master fundamentals of advanced mass transfer and separation science
2. Understand membrane technology design and optimization
3. Apply energy-efficient distillation and hybrid separation systems
4. Analyze industrial adsorption and desorption processes
5. Develop skills in liquid-liquid and gas-liquid extraction systems
6. Evaluate carbon capture and CO? separation technologies
7. Implement zero-liquid discharge (ZLD) systems in industry
8. Optimize process intensification in separation units
9. Integrate AI and machine learning in separation process control
10. Understand nanotechnology-based filtration systems
11. Improve process sustainability and green engineering practices
12. Design multi-stage separation and hybrid process systems
13. Solve real-world problems in industrial-scale separation operations

Target Audience

1. Chemical and Process Engineers
2. Petroleum and Petrochemical Engineers
3. Environmental Engineers and Water Treatment Specialists
4. Pharmaceutical Manufacturing Professionals
5. R&D Scientists in Separation Technology
6. Plant Operators and Production Supervisors
7. Graduate and Postgraduate Engineering Students
8. Industrial Consultants and Process Designers

Course Modules

Module 1: Fundamentals of Separation Processes

- Mass transfer principles and equilibrium stages
- Driving forces in separation systems
- Thermodynamics of mixtures
- Industrial relevance overview
- **Case Study:** Crude oil fractionation basics in refinery units

Module 2: Advanced Distillation Systems

- Multicomponent distillation design
- Azeotropic and extractive distillation
- Energy integration strategies
- Column internals and efficiency
- **Case Study:** Ethanol-water separation optimization

Module 3: Membrane Separation Technology

- Membrane types and materials
- Reverse osmosis and nanofiltration
- Membrane fouling control
- Industrial scaling methods
- **Case Study:** Desalination plant performance improvement

Module 4: Adsorption and Ion Exchange

- Adsorbent materials and kinetics
- Fixed bed and fluidized bed systems
- Regeneration techniques
- Industrial applications
- **Case Study:** Gas purification using activated carbon beds

Module 5: Gas Separation Technologies

- PSA and VPSA systems
- Cryogenic gas separation
- Hydrogen purification systems
- CO? capture technologies
- **Case Study:** Hydrogen recovery in ammonia plants

Module 6: Liquid-Liquid Extraction

- Solvent selection criteria
- Phase equilibrium modeling
- Mixer-settler design
- Industrial solvent recovery
- **Case Study:** Aromatics extraction in petrochemical industry

Module 7: Gas-Liquid Separation Systems

- Absorption and stripping operations
- Packed and tray towers
- Mass transfer efficiency
- Industrial gas treatment
- **Case Study:** Ammonia removal from wastewater

Module 8: Hybrid Separation Technologies

- Membrane-distillation integration
- Adsorption-membrane systems
- Process intensification techniques
- Energy optimization methods
- **Case Study:** Hybrid CO? capture system in power plants

Module 9: Nanotechnology in Separation

- Nanomaterial membranes
- Surface modification techniques

- Selective permeability design
- Emerging nanotech trends
- **Case Study:** Graphene-based water filtration system

Module 10: Process Simulation & Modeling

- Aspen Plus and process simulators
- Thermodynamic models
- Sensitivity analysis
- Optimization tools
- **Case Study:** Distillation column simulation for refinery upgrade

Module 11: Energy Efficient Separation Design

- Heat integration strategies
- Pinch analysis in separation
- Low-energy process design
- Sustainability metrics
- **Case Study:** Energy reduction in petrochemical separation units

Module 12: Environmental Separation Systems

- Wastewater treatment technologies
- Heavy metal removal
- Air pollution control systems
- ZLD system design
- **Case Study:** Industrial effluent treatment plant design

Module 13: Carbon Capture & Climate Technologies

- CCS and CCUS systems
- Solvent-based capture processes
- Solid sorbent technologies
- Regulatory frameworks
- **Case Study:** Carbon capture in cement industry

Module 14: Industrial Troubleshooting & Optimization

- Common operational failures
- Performance diagnostics
- Fouling and scaling control
- Efficiency improvement methods
- **Case Study:** Membrane fouling in seawater desalination plant

Module 15: Emerging Trends in Separation Technologies

- AI-driven process optimization
- Smart sensors in separation systems
- Digital twin applications
- Future of sustainable separation
- **Case Study:** Digital twin in refinery separation unit

Training Methodology

- 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	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

Start Date	End Date	Location	Price
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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