Cryogenic Process 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

Cryogenic Process Engineering is a specialized field focused on the design, operation, and optimization of systems that handle gases and fluids at extremely low temperatures (below -150°C). Cryogenic Process Engineering Training Course provides a comprehensive foundation in cryogenic technology, LNG processing, gas liquefaction, refrigeration cycles, and ultra-low temperature systems used in energy, aerospace, medical, and industrial sectors. Participants will gain deep insights into thermodynamics of cryogenic fluids, heat transfer mechanisms, material behavior at low temperatures, and safety protocols for high-risk cryogenic environments.

With the rapid growth of LNG infrastructure, hydrogen economy, space exploration, and industrial gas applications, cryogenic engineering has become a critical competency in modern process industries. This course equips engineers, technicians, and professionals with advanced skills in cryogenic plant design, process optimization, energy efficiency, and troubleshooting of liquefaction systems. It bridges theoretical principles with real-world industrial applications, ensuring participants are industry-ready for high-demand roles in oil & gas, petrochemicals, renewable hydrogen, and industrial refrigeration systems.

Programme Curriculum

Cryogenic Process Engineering Training Course

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Course Duration

5 days

Course Objectives

1. Master fundamentals of cryogenic thermodynamics and phase behavior of gases
2. Understand LNG liquefaction processes and gas separation technologies
3. Analyze Joule-Thomson effect and expansion refrigeration cycles
4. Apply principles of heat exchanger design for cryogenic applications
5. Evaluate cryogenic insulation systems and thermal protection techniques
6. Develop skills in hydrogen liquefaction and storage technologies
7. Implement process safety management in low-temperature environments
8. Optimize energy efficiency in cryogenic plants
9. Understand material selection for ultra-low temperature operations
10. Operate and troubleshoot cryogenic compressors, pumps, and expanders
11. Design and simulate cryogenic process flow diagrams
12. Apply industrial gas production and air separation unit (ASU) principles
13. Gain expertise in emerging cryogenic applications in space and clean energy systems

Target Audience

- Process Engineers in oil & gas and LNG industries
- Mechanical Engineers specializing in thermal systems
- Chemical Engineers working in gas processing plants
- HVAC and refrigeration professionals
- Energy sector professionals in hydrogen and LNG value chains
- Plant Operators and Maintenance Technicians
- Graduate engineers in chemical, mechanical, and petroleum disciplines
- R&D professionals in cryogenics and advanced energy systems

Course Modules

Module 1: Fundamentals of Cryogenic Engineering

- Properties of cryogenic fluids
- Phase change behavior at low temperatures
- Temperature-pressure relationships
- Gas liquefaction basics
- Introduction to cryogenic safety
- **Case Study:** LNG plant cold box performance analysis in Qatar Gas facilities

Module 2: Thermodynamics of Cryogenic Systems

- Joule-Thomson expansion

- Isentropic & isenthalpic processes
- Refrigeration cycles
- Entropy and enthalpy analysis
- Gas liquefaction efficiency
- **Case Study:** Optimization of nitrogen liquefaction plant energy consumption

Module 3: LNG Process Engineering

- LNG production chain
- Pre-treatment of natural gas
- Liquefaction technologies
- Storage and regasification systems
- LNG transport systems
- **Case Study:** Shell Prelude FLNG floating LNG project analysis

Module 4: Cryogenic Equipment Design

- Heat exchangers
- Cryogenic pumps and compressors
- Expanders and turboexpanders
- Valves and piping systems
- Equipment sizing and selection
- **Case Study:** Air Products ASU heat exchanger efficiency improvement

Module 5: Cryogenic Insulation & Materials

- Thermal insulation systems
- Vacuum insulation techniques
- Material brittleness at low temperature
- Stainless steel and aluminum alloys
- Structural integrity under cryogenic stress
- **Case Study:** SpaceX rocket fuel tank insulation system design

Module 6: Air Separation & Industrial Gases

- ASU process flow
- Oxygen, nitrogen, argon production
- Fractional distillation at cryogenic temperatures
- Gas purification methods
- Industrial applications
- **Case Study:** Linde ASU plant oxygen optimization for steel manufacturing

Module 7: Hydrogen & Clean Energy Cryogenics

- Hydrogen liquefaction process
- Storage and transport challenges
- Boil-off gas management
- Fuel cell integration
- Green hydrogen infrastructure
- **Case Study:** Liquid hydrogen storage system in NASA Kennedy Space Center

Module 8: Cryogenic Safety, Control & Troubleshooting

- Hazard identification in cryogenic systems
- Pressure relief systems
- Leak detection technologies
- Control systems and instrumentation
- Emergency shutdown procedures
- **Case Study:** Industrial accident prevention analysis in LNG terminal operations

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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