Hydrometallurgy Fundamentals 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

Hydrometallurgy is a cornerstone of modern mineral processing and extractive metallurgy, enabling the efficient, sustainable, and cost-effective recovery of valuable metals from ores, concentrates, and recycled materials. With increasing global demand for critical metals, hydrometallurgical techniques are becoming essential for supporting green mining, circular economy strategies, and low-carbon metal production.

Hydrometallurgy Fundamentals Training Course is designed to bridge theory with industrial application, focusing on process optimization, chemical kinetics, thermodynamics, and plant-scale operations. Participants will gain hands-on understanding of modern hydrometallurgical flowsheets used in battery metals processing, copper heap leaching, gold cyanidation alternatives, and e-waste recycling technologies. The course emphasizes sustainability, digital metallurgical modeling, ESG compliance, and process intensification, preparing professionals to contribute effectively to next-generation mineral processing industries.

Programme Curriculum

Hydrometallurgy Fundamentals Training Course

Introduction

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Course Duration

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Course Objectives

1. Understand hydrometallurgical process fundamentals and metal recovery pathways
2. Apply leaching kinetics and thermodynamic principles in process design
3. Analyze acid and alkaline leaching systems for base and critical metals
4. Evaluate heap leaching and in-situ leaching technologies
5. Master solvent extraction and electrowinning (EW) operations
6. Develop skills in ion exchange and adsorption technologies
7. Optimize copper, nickel, cobalt, and lithium recovery circuits
8. Understand battery recycling and urban mining hydrometallurgy
9. Interpret Eh-pH diagrams for metal stability prediction
10. Design flowsheets for sustainable metal extraction processes
11. Improve process efficiency through reagent and energy optimization
12. Apply ESG-driven sustainable mining and green metallurgy principles
13. Integrate digital process simulation and metallurgical data analytics

Target Audience

1. Metallurgical engineers and process engineers
2. Mining engineers and mineral processing professionals
3. Chemical engineers in extractive industries
4. Graduate students in metallurgy and materials science
5. Plant operators and hydrometallurgy technicians
6. R&D professionals in battery recycling and critical metals
7. Environmental and sustainability engineers in mining sector
8. Technical consultants in mineral processing and metallurgy

Course Modules

Module 1: Introduction to Hydrometallurgy & Metal Extraction Systems

- Overview of hydrometallurgical vs pyrometallurgical routes
- Metal dissolution mechanisms and aqueous chemistry
- Role of reagents-acids, bases, oxidants, reductants
- Process flow in modern metal extraction plants
- Industrial applications in mining and recycling
- **Case Study:** Copper extraction from oxide ores using acid leaching in Chile operations

Module 2: Thermodynamics & Eh-pH Diagrams

- Fundamentals of Gibbs free energy in metal dissolution
- Construction and interpretation of Pourbaix diagrams
- Metal stability regions in aqueous systems
- Oxidation-reduction potential control strategies
- Prediction of corrosion and passivation behavior

- **Case Study:** Gold stability and cyanide leaching optimization using Eh-pH control

Module 3: Leaching Technologies & Reaction Kinetics

- Acid, alkaline, and bioleaching mechanisms
- Shrinking core model and diffusion control
- Temperature and pressure effects on leaching rate
- Reagent concentration optimization
- Reactor design for leaching systems
- **Case Study:** Nickel laterite high-pressure acid leaching (HPAL) plant

Module 4: Heap Leaching & In-Situ Recovery

- Heap construction and irrigation systems
- Percolation and solution flow dynamics
- Microbial-assisted leaching applications
- Solution collection and pregnant leach solution (PLS) management
- Environmental containment strategies
- **Case Study:** Gold heap leaching operations in Nevada mining projects

Module 5: Solid-Liquid Separation & Purification

- Thickening, filtration, and clarification techniques
- Impurity removal strategies
- pH adjustment and precipitation reactions
- Coagulation and flocculation processes
- Process water recycling systems
- **Case Study:** Iron removal in copper solvent extraction circuits

Module 6: Solvent Extraction (SX) & Ion Exchange

- Organic and aqueous phase chemistry
- Selective metal separation principles
- Mixer-settler and column design
- Resin selection and regeneration in ion exchange
- Stripping and loading cycles
- **Case Study:** Copper SX-EW plant operations in Zambia

Module 7: Electrowinning & Electrometallurgy

- Electrochemical deposition fundamentals
- Cathode and anode reactions
- Current efficiency and energy consumption optimization
- Cell design and scaling factors
- Metal purity control techniques
- **Case Study:** High-purity copper cathode production in Chilean refineries

Module 8: Battery Metals & Circular Hydrometallurgy

- Lithium-ion battery recycling processes
- Recovery of cobalt, nickel, and manganese
- Hydrometallurgical e-waste treatment

- Green chemistry approaches in recycling
- ESG compliance and waste minimization
- **Case Study:** Industrial-scale lithium battery recycling plant in China

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	27 Nov 2026	Online	$1,000

Start Date	End Date	Location	Price
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:

Register Online Now

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