Pyrometallurgy Basics 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

Pyrometallurgy Basics Training Course is designed to equip learners with strong foundational and applied knowledge of high-temperature metallurgical processes, including smelting, roasting, calcination, sintering, and metal extraction techniques. This training integrates modern mineral processing technologies, furnace operations, thermochemical principles, and industrial metallurgy workflows to develop practical competency in metal recovery from ores and concentrates. With increasing global demand for efficient metal extraction, energy optimization, and sustainable metallurgical practices, this course provides critical exposure to real-world pyrometallurgical operations used in copper, nickel, iron, lead, zinc, and precious metal industries.

The program emphasizes hands-on learning, simulation-based training, and industrial case analysis to bridge the gap between theoretical metallurgy and plant operations. Learners will explore furnace design, slag chemistry, reduction-oxidation reactions, and process optimization strategies aligned with modern Industry 4.0 metallurgical systems. This training is ideal for professionals aiming to enhance expertise in extractive metallurgy, process engineering, mineral beneficiation, and metallurgical plant operations, ensuring readiness for roles in mining, smelting plants, refineries, and metallurgical laboratories.

Programme Curriculum

Pyrometallurgy Basics Training Course

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Course Duration

5 days

Course Objectives

1. Understand fundamentals of pyrometallurgical extraction processes
2. Apply principles of thermodynamics in high-temperature metallurgy
3. Analyze ore-to-metal conversion mechanisms
4. Master smelting furnace operations and control systems
5. Evaluate roasting and calcination reactions in industrial applications
6. Optimize energy efficiency in metallurgical plants
7. Interpret phase diagrams and slag-metal interactions
8. Implement sustainable metallurgy and emissions control
9. Develop skills in furnace temperature regulation and process automation
10. Assess metal recovery efficiency and yield improvement techniques
11. Understand reduction-oxidation chemistry in extraction metallurgy
12. Gain exposure to industrial pyrometallurgical case studies
13. Apply process troubleshooting and plant optimization strategies

Target Audience

1. Mining and Metallurgical Engineers
2. Process Engineers in Smelting Plants
3. Chemical Engineering Graduates
4. Industrial Metallurgists
5. Plant Operators and Technicians
6. Mineral Processing Professionals
7. Research and Development Scientists
8. Environmental and Sustainability Engineers in Mining Sector

Course Modules

Module 1: Introduction to Pyrometallurgy

- Fundamentals of high-temperature metal extraction
- Classification of pyrometallurgical processes
- Overview of industrial metal production chains
- Role of heat and chemical reactions in metallurgy
- Case Study: Copper extraction from chalcopyrite ores

Module 2: Thermodynamics & Reaction Chemistry

- Gibbs free energy in metal extraction
- Ellingham diagrams interpretation
- Redox reactions in metallurgical systems
- Equilibrium conditions in smelting
- Case Study: Iron reduction in blast furnace

Module 3: Ore Preparation & Pre-Treatment

- Crushing, grinding, and beneficiation overview
- Roasting and calcination processes
- Removal of impurities before smelting
- Particle size and reaction efficiency impact
- Case Study: Zinc sulfide roasting process

Module 4: Smelting Processes

- Blast furnace and electric furnace operations
- Matte formation and metal separation
- Flux selection and slag formation
- Heat balance in smelting operations
- Case Study: Nickel matte smelting process

Module 5: Slag Chemistry & Metal Recovery

- Slag composition and behavior
- Metal-slag separation mechanisms
- Viscosity and melting point control
- Recovery of valuable metals from slag
- Case Study: Gold recovery from copper slag

Module 6: Furnaces & Reactor Design

- Types of metallurgical furnaces
- Refractory materials and lining systems
- Energy efficiency in furnace design
- Gas flow and temperature distribution
- Case Study: Electric arc furnace steel production

Module 7: Environmental & Energy Optimization

- Emission control in pyrometallurgy
- Dust and gas treatment systems
- Carbon footprint reduction strategies
- Waste heat recovery systems
- Case Study: SO? capture in copper smelters

Module 8: Industrial Applications & Troubleshooting

- Process control and automation systems
- Common operational failures and solutions
- Quality control in metal production
- Optimization of recovery rates

- Case Study: Lead-zinc smelter efficiency improvement

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
23 Nov 2026	27 Nov 2026	Physical	$1,500
23 Nov 2026	27 Nov 2026	Physical	$3,000

Start Date	End Date	Location	Price
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

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