# Experimental Design in Mineral Processing Training Course

Professional Development Training Course Outline

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|---|---|---|---|
| **Category** | General Training | **Duration** | 5 Days |
| **Base Fee** | $1,500 USD | **Delivery Mode** | Online / On-site Hybrid |

## Course Introduction

In today’s competitive mining and minerals industry, organizations are increasingly relying on AI-enabled process optimization, predictive metallurgy, multivariate experimentation, and sustainable beneficiation strategies to maximize yield while reducing operational costs and environmental impact. Experimental Design in Mineral Processing Training Course bridges the gap between theoretical statistical methods and real-world mineral processing applications, enabling professionals to design robust experiments that improve flotation efficiency, grinding performance, leaching kinetics, and separation processes.

Participants will gain hands-on expertise in factorial design, response surface methodology (RSM), Taguchi techniques, and machine learning-assisted experimental planning. The training emphasizes practical implementation in concentrators, metallurgical plants, and pilot-scale operations. By integrating process analytics, simulation tools, and real plant case studies, the course ensures participants develop the capability to optimize complex mineral systems under uncertainty, variability, and industrial constraints. This makes it a critical upskilling program for modern mining operations focused on digital transformation, operational excellence, and sustainable mineral beneficiation.

## Programme Curriculum

**Experimental Design in Mineral Processing Training Course**

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**Course Duration**

5 days

**Course Objectives**

1. Master Design of Experiments (DoE) in Mineral Processing
2. Apply Response Surface Methodology (RSM) for process optimization
3. Develop skills in statistical process optimization in mining
4. Implement factorial and fractional factorial experimental designs
5. Optimize flotation recovery and grade using experimental models
6. Enhance grinding circuit performance through DoE techniques
7. Analyze mineral processing data using ANOVA and regression modeling
8. Apply Taguchi robust design methods in metallurgical processes
9. Integrate machine learning with experimental design frameworks
10. Improve leaching efficiency and reagent optimization
11. Conduct pilot plant experimental design and scale-up analysis
12. Minimize operational costs through process optimization strategies
13. Build capability in data-driven mineral beneficiation decision-making

**Target Audience**

1. Mineral Processing Engineers
2. Metallurgical Engineers
3. Mining Process Engineers
4. Plant Operations Managers
5. Research & Development Scientists
6. Geometallurgists
7. Data Analysts in Mining Industry
8. Graduate Students in Extractive Metallurgy

**Course Modules**

**Module 1: Fundamentals of Experimental Design in Mineral Processing**

- Principles of DoE and industrial applications
- Variables, responses, and experimental factors
- Randomization, replication, blocking techniques
- Introduction to mineral processing variability
- Statistical thinking in metallurgy

- **Case Study:** Optimization of ore grind size distribution in a gold processing plant using basic factorial design.

**Module 2: Factorial and Fractional Factorial Designs**

- Full factorial experimental setup
- Fractional factorial reduction techniques
- Interaction effects in mineral systems
- Screening of process variables
- Cost-effective experimentation strategies
- **Case Study:** Reduction of reagent usage in a copper flotation circuit using fractional factorial design.

**Module 3: Response Surface Methodology (RSM)**

- Central composite design (CCD)
- Box-Behnken design applications
- Quadratic modelling of mineral processes
- Optimization of multi-variable systems
- Surface contour interpretation
- **Case Study:** Maximizing iron ore recovery using RSM-based flotation parameter optimization.

**Module 4: Statistical Analysis & ANOVA Techniques**

- Hypothesis testing in mineral experiments
- Analysis of variance (ANOVA)
- Regression diagnostics and model validation
- Residual analysis in metallurgical data
- Data interpretation for decision-making
- **Case Study:** Statistical validation of leaching efficiency improvement in a uranium processing plant.

**Module 5: Taguchi Methods & Robust Design**

- Signal-to-noise ratio concepts
- Orthogonal arrays in mineral testing
- Robust parameter design
- Noise factor identification
- Process stability enhancement
- **Case Study:** Stabilizing recovery rates in a platinum group metals (PGM) flotation circuit.

**Module 6: Process Optimization in Grinding & Comminution**

- Ball mill and SAG mill optimization
- Energy efficiency modeling
- Particle size distribution analysis
- Throughput improvement strategies
- Wear and liner optimization
- **Case Study:** Energy reduction in a copper grinding circuit using experimental optimization techniques.

**Module 7: Flotation & Hydrometallurgical Process Design**

- Reagent optimization strategies
- pH and chemical conditioning effects

- Bubble-particle interaction modeling
- Leaching kinetics experimentation
- Separation efficiency improvement
- **Case Study:** Improving lithium recovery through optimized flotation reagent design.

**Module 8: Advanced Data Analytics & AI Integration in DoE**

- Machine learning in experimental design
- Predictive modeling for mineral processing
- Digital twins in metallurgical plants
- Multivariate optimization techniques
- Big data integration in mining operations
- **Case Study:** AI-assisted optimization of a platinum concentrator plant throughput and recovery.

## 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 |
| **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