Professional Development Courses

STRATEGIC MINE PLANNING & OPTIMIZATION

SOFTWARE: GEOVIA WHITTLE

STRATEGIC MINE PLANNING & OPTIMIZATION

Location

CBD, Perth, Western Australia

Dates

April 8th-12th, 2019 - 5 days, 8:30AM-4:30PM

Early Registration Deadline - 15% discount

Friday, March 1st, 2019

- **Second registration 10% discount**
- **Third registration 15% discount**

Registration Deadline

Friday, April 1st, 2019

Course Fee

AUD $4500 (excluding taxes)

Instructor

Hooman Askari is a professor of mining engineering in the School of Mining and Petroleum Engineering at the University of Alberta, Canada. He teaches and conducts research into mine planning & design and simulation of mining systems. Hooman is a registered professional mining engineer with more than two decades of operational, consulting, research, and teaching experience in the area of open pit mine planning and design. He has a strong track record of success in leading the Mining Optimization Laboratory (MOL) research team sponsored by industry partners into development, testing, and delivering mine planning optimization prototype software and mine simulation models to major mining companies. He consults as the Principal Engineer on long-term to short-term open pit production scheduling optimization and simulation of mining-systems through OptiTek Mining Consulting Ltd.

Registration

Send the completed registration form to: registration@optitek.ca

For more information contact **Hooman Askari** at:
hooman@optitek.ca
Phone: +1 (780) 893-9365

Who Should Attend

The Strategic Mine Planning and Optimization course is a comprehensive five-day course designed for mining and resource industry professionals including directors, project managers, mine planners, mining engineers, geoscientists, geologists, managers, metallurgists, financial analyst, and decision makers from exploration to operations. It is ideally suited to those from industry who wish to gain a more in depth and hands-on knowledge of modern strategic mine planning and optimization software tools and theory.

Cancellation Policy

Notification of cancellation received in writing by **Friday, April 1st, 2019** will incur a 20% cancellation fee. No refund will be made after this time.

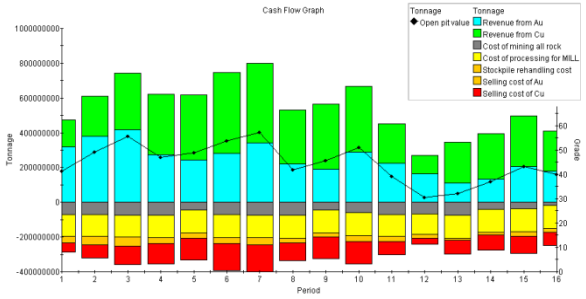
Course Delivery

- Lectures on theoretical concepts
- Documented step by step computer labs instructions
- Incremental exercises and project work
- Presentation of real mining case studies

Mining Optimization Laboratory (MOL)

MOL research focuses on using operations research and advanced analytical methods such as mathematical modeling, optimization, discrete event/continuous simulation, and intelligent agents to arrive optimal or near-optimal solutions to complex, large-scale mine planning/operations decision-making problems.

http://www.ualberta.ca/MOL/



Participants are required to bring a Laptop Software will be provided for the Course

First Name: _____

Last Name: _____

Company Name: _____

Job Title: _____

Address: _____

_____

City: _____

Prov/ State: _____

Country: _____

Email: _____

Phone: _____

Visa ☐ Master Card ☐

Invoice ☐ By Phone ☐

Card # _____

Expiry _____/_____

CVV: _____

(Fee + 10% GST) AUD$ _____

Name on Card: _____

Signature: _____

Professional Development Courses

STRATEGIC MINE PLANNING & OPTIMIZATION

SOFTWARE: GEOVIA WHITTLE

COURSE DESCRIPTION

Software: GEOVIA Whittle & Excel Solver

Strategic mine planning optimization process is the backbone of mining operations. In mining projects, deviations from optimal mine plans will result in significant financial losses, future financial liabilities, delayed reclamation, and resource sterilization. The life-of-mine production schedule determines the order of extraction of materials and their destination over the mine-life. In this course, principles and fundamental concepts involved in strategic mine planning and optimization are presented. Subjects covered are block value calculations; mining revenues and costs; open pit limit optimization using manual method, floating cone, and 2D & 3D Lerchs and Grossmann algorithms; Pseudo Flow algorithm, life-of-mine production planning; mine-life estimation; cut-off grade optimization and Lane's theory; simultaneous optimization; multi-mine multi-process production scheduling, and an approach to managing grade uncertainty. Mathematical optimization models and case studies for long-term open pit mine planning will be presented. Blending problem formulations are setup and solved in Excel Solver. The course complements theory with comprehensive instructions and hands-on experience completing a project using GEOVIA Whittle strategic mine planning software. Comparative analysis of different production scenarios, stockpiling, cutoff optimization, SIMO, multi-mine and their impacts on the bottom line of the mining business is illustrated.

Outcomes of the course include:

- Understand concepts of strategic mine planning
- How optimization improves economic performance
- Complete a strategic mine planning study in Whittle
- What costs should be included in pit optimization
- Principles of Lerchs & Grossmann 3D algorithm
- Principles of Pseudo Flow algorithm
- Pit limits optimization with practical push-backs
- Generate optimal shells, reports and schedules
- Push-back design with a minimum mining width
- Production scheduling – using contractors
- Advanced techniques with mining direction control – Oil Sands
- Buffer Stockpiles and Extractive Blending
- Understand cut-off optimization & Lane's Theory
- Advanced simultaneous optimization (SIMO)
- Calculate sensitivities to develop risk reduction strategy
- New feature of CAPEX optimization
- Multi-mine scheduling, feeding multi-process processing plant
- Managing the risk associated with grade uncertainty
- Understand the potential value of the deposit.
- Target areas for future drilling
- Quantify the Impact of grade uncertainty on scheduling
- Case studies – Iron Ore; Gold-Copper, and Oil Sands deposits

Day 1

Module 1: Pit Limits Optimization

- Introduction to Strategic Mine Planning & Optimization
- Pit Limits- Floating Cone, 2D & 3D Lerchs & Grossmann
- Pseudo Flow algorithm
- Block Value Calculations
- What Costs to Include in Pit Optimization?
- Project data exploration history and field campaign – Iron Ore
- Project cost calculation
  - Waste and ore mining costs
  - Ore processing costs and recoveries
  - General and administrative costs
- Whittle Lab01 - Open Pit Limit Optimization
  - Grade-tonnage curve and Reblocking node
  - Slope set node and Pit Shells node
  - Choose 3D LG or Pseudo Flow algorithm
  - Operational scenario node and Revenue factors
  - Ore selection discussion and Pit by pit graph
  - Compressed revenue factors
  - Schedule graph and bench schedules
  - Block size and SMU
  - Skin analysis

Day 2

Module 2: Life-of-Mine Production Scheduling

- Production Scheduling Concepts
- Whittle Lab02 - Long-Term Production Scheduling
  - Schedule graph and bench schedules
  - Mine-life estimation and Sharing time related costs
  - Push back chooser
  - Milawa NPV and Milawa Balanced algorithms
  - Push-backs with minimum mining width
  - Benchmark schedules and optimized schedules
  - Implementing and evaluating mining direction
  - Sensitivity analysis using spider graph
- Whittle Lab03 - Practical Push Backs – NPV
  - Mining with contractors
  - Fixed and variable lead and lag
  - Interim push-back design
  - The impact of Geo-metallurgy/ore hardness
  - Truck hours constraint
- Whittle Exercise 1 – Gold-Copper Deposit – Pit Optimization

Day 3

Module 3: Direction Control and Blending

- Whittle Lab04 – Control Mining Direction and Pre-stripping
  - Mining Direction Control
  - Oils Sands deposit exercise
  - Pre-stripping
- Whittle Lab05 – Buffer Stockpiles
  - Multi-element stockpiles, low, medium, and high grade
  - Rehandling cost calculations
  - Stockpile cut-offs
- Whittle Lab06 – Extractive and Bulk Blending
  - Blending stockpiles
  - Blending bins (manual and automatic)
  - Blending to control head-grade
  - Concept of blend bins
  - Control the head-grade by blending constraints
  - Using CPLEX engine
- Whittle Exercise 2 – Gold- Copper Deposit – Scheduling
- Whittle Exercise 3 – Gold- Copper Deposit – Blending & Stockpiling

Day 4

Module 4: Cut-off Grade Optimization & Stockpiling

- Cut-off Optimization - Lane's Theory
  - Cut-off Optimization – Maximizing Profit
  - Cut-off Optimization – Maximizing NPV
- Whittle Lab07 - Cutoff Grade Optimization Step by Step

Module 5: Simultaneous Optimization (SIMO)

- Introduction to simultaneous optimization
- Integrating scheduling, blending, stockpiling, and cutoff
- Advanced optimization control
  - Optimization tab
  - Blend bins tab
  - Manual versus automatic bins
  - Stockpiles tab
  - Comparative analysis of value generated by SIMO
- Whittle Lab08 – Simultaneous Optimization
  - CAPEX Optimization process
  - Purchase additional mining and processing capacity
  - Use period validation to control additional limits
  - Simultaneous Reporting – report CAPEX limits and costs

Day 5

Module 6: Managing Risk and Grade Uncertainty

- Use command line for process automation and simulation
  - Reduce design cycle time through integrating workflow
- Establishing a final pit-shell under grade uncertainty
- Equi-probable realizations of grade within the orebody
- Optimal pit for Krig, E-type models and P90 & P10 realizations
- Impact of grade uncertainty on the final pit limit
- Quantifying the Impact of grade uncertainty on scheduling
- Whittle Lab09 – Final pit in the presence of grade uncertainty.

Module 7: Multi-Mine Multi-Process Optimization

- Introduction multi-mine multi-process optimization
- Whittle Lab10 – Iron Ore Multi-Mine Project
  - Merging multiple block models in one project
  - Mining limits applied to multiple mines
  - Mining limits on individual mines
  - Multi-process dry and wet separation
  - Multiple/alternative processing streams
  - Multiple/alternative products
  - A complex mine logistics example
  - Lessons learnt from optimizing multi-mine